COAL AGE

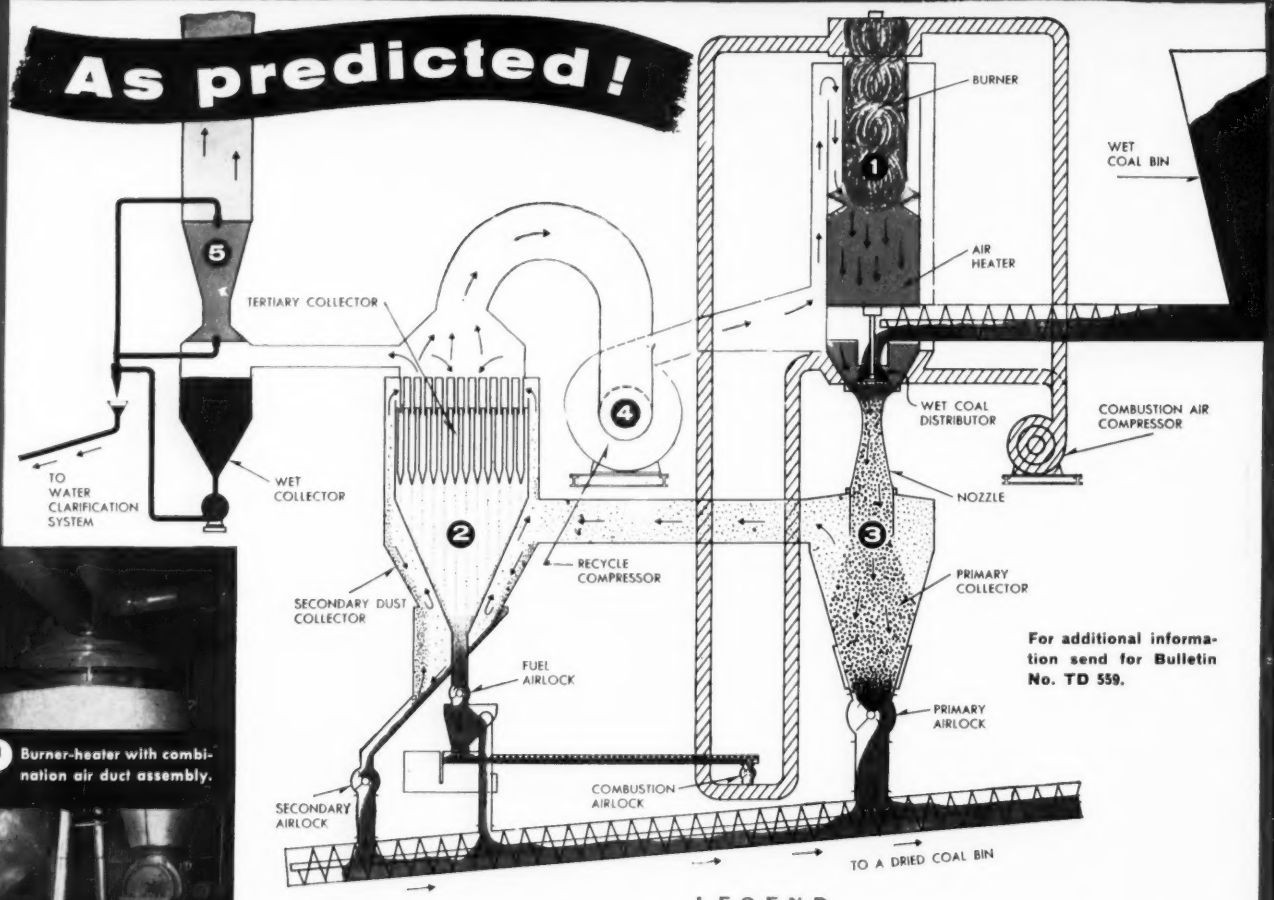
JUNE, 1960
PRICE $1

Pittsburg & Midway's
Diamond Jubilee Story . . . p 72

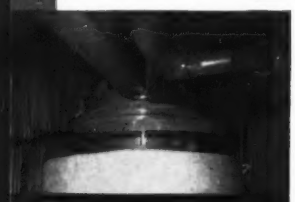
A McGRAW-HILL PUBLICATION

U. S. Steel Opens Maple Creek . . . p 94

As predicted!



For additional information send for Bulletin No. TD 559.

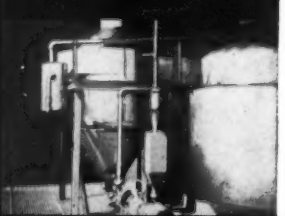


1 Burner-heater with combination air duct assembly.

2 Lower section of secondary dust collector at left;

3 Primary collector with airlock at upper right; and clean coal collecting conveyor.

4 Recycle compressor and upper section of secondary dust collector.



5 Wet collector and exhaust duct for scrubbed gas.

LESS HP = $ $ SAVED
MORE BTU = BETTER PRODUCT

FAIRMONT-built TAILOR STREAM-FLO THERMAL DRYER*

The new Tailor Stream-Flo Thermal Dryer dries feed products up to 2″; recovers the finest dusts. Product is conveyed through drying chamber by gravity, thereby using much less horsepower.

The Tailor Dryer produces a dried product with 200-300 BTU per pound higher heating value compared to other dryers because of the lack of oxidation within the drying atmosphere.

The compact, low maintenance assembly comprises only five major elements in its entire system!

*Tailor Stream-Flo Thermal Dryer is the trade name for thermal dryers of Tailor & Co., Davenport, Iowa.

FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

ENGINEERS • DESIGNERS • FABRICATORS and CONSTRUCTORS

The belt with the built-in fire extinguisher

THERE'S no fuel for fire in that conveyor belt. It's a B.F.Goodrich belt made with a special fire-resisting rubber. It'll neither support combustion nor spread flame.

In those states that require ventilation stoppings if fire-resisting belts are *not* used, this B.F.Goodrich belt eliminates those costly protective walls, is saving mines thousands of dollars each year.

Besides making belts safer, this special fire-resisting rubber also has high resistance to impact, abrasion, grease, tearing, cutting, gouging and the deteriorating effects of mildew. This means BFG fire-resisting belts can be expected to equal, or surpass, the long service records made by other B.F.Goodrich Caricoal belts in underground mines.

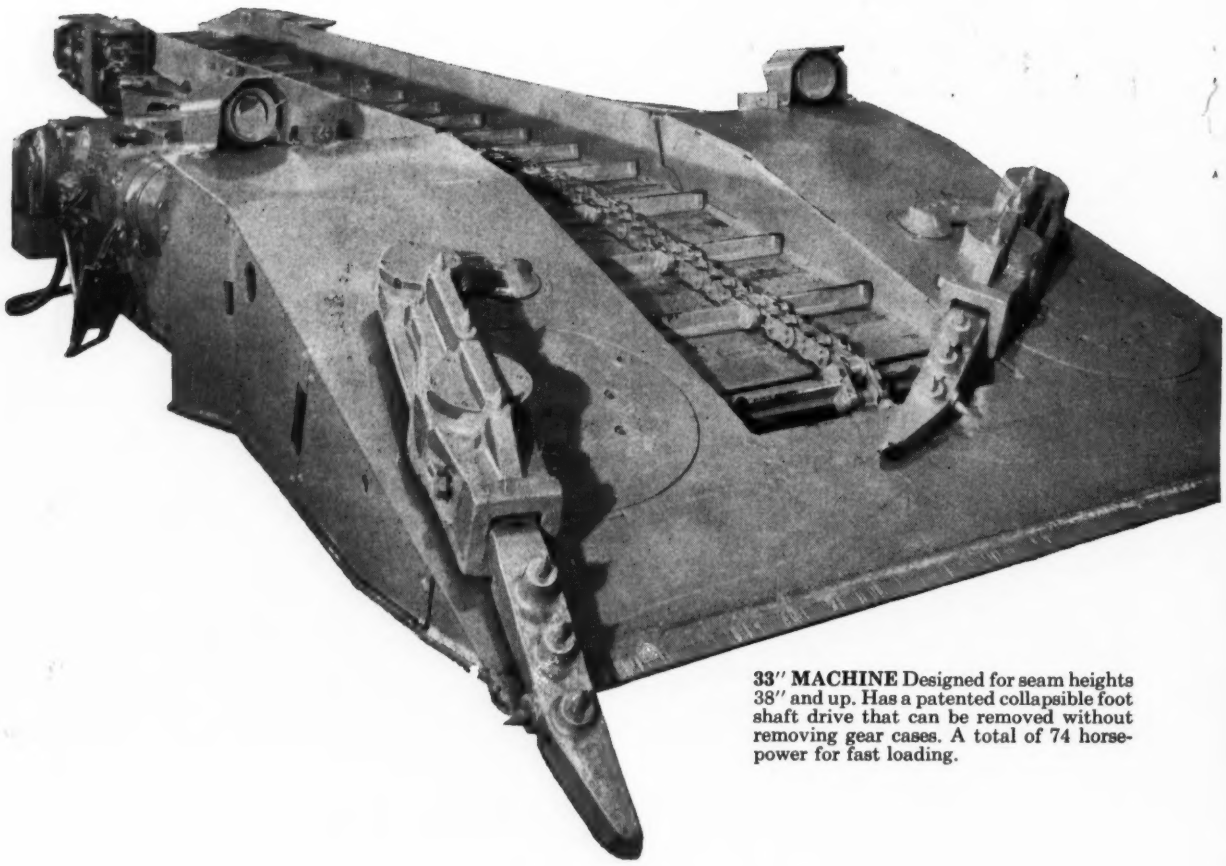
And notice the natural troughing. The use of Nyfil fabrics makes this a more flexible belt, able to carry coal at high speed without spilling a lot of it along the way. Makes it an ideal belt for a rope conveyor.

Next time you're considering a conveyor belt purchase, look into the safety and other cost-cutting advantages you can get with BFG fire-resisting belts. They've been accepted for listing as fire-resistant by the Bureau of Mines (Acceptance No. 28-6). Your B.F.Goodrich distributor can tell you more, or write the *B.F.Goodrich Industrial Products Company, Department M-854, Akron 18, Ohio.*

B.F.Goodrich

CONVEYOR BELTS

NOW... A COMPLETE LINE OF JOY 14



33" MACHINE Designed for seam heights 38" and up. Has a patented collapsible foot shaft drive that can be removed without removing gear cases. A total of 74 horsepower for fast loading.

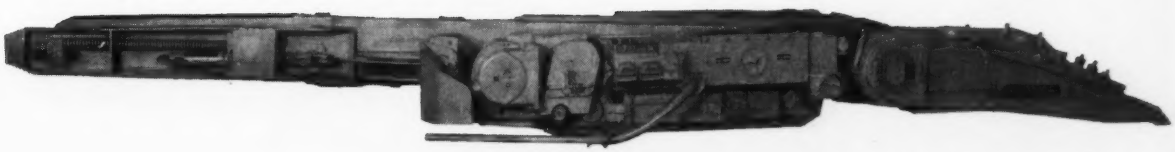
Joy's new line of 14BU-10 loaders is a family of high-production models that fits every mining condition. All have the same basic design—built for production, dependability and ease of maintenance. They have "swing-out" electrical panels for easy access to electrical controls. Each gear case is easily removable as a unit. Motors, hydraulic pump and other mechanical elements are all mounted on the outside of the machine for easy inspection and maintenance. There are no shifting clutches, torque converters or complicated linkages.

The 14BU-10's load faster because they have a wider loading head and a controlled gathering arm speed of 50 RPM (no "egg-beater" action) tied to loading tram speed. A straight through conveyor, thirty inches wide, loads out the largest lumps with ease. Tramming is fast because of a simple two-speed system. Two 15 hp motors run in series for slow tramming; in parallel for fast tram.

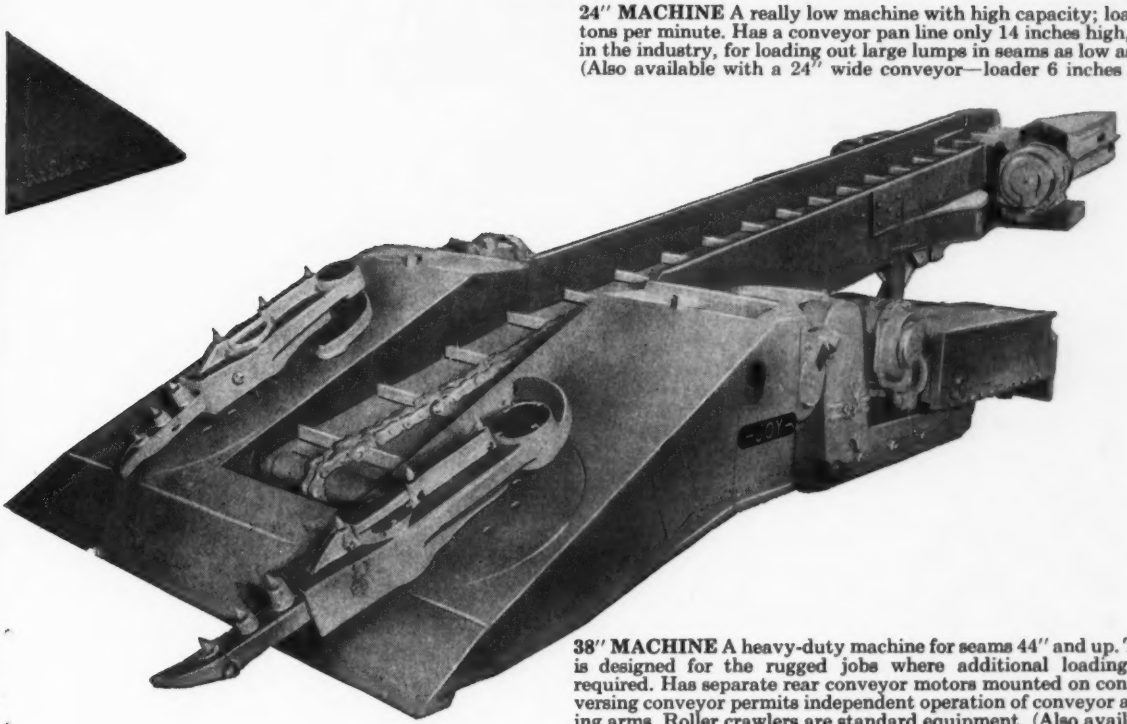
Ground clearance is never a problem because of a unique design feature. The box frame type chassis has been eliminated by placing two solid shaft members as cross ties between the crawler frames. Coal cannot accumulate under the conveyor. The absence of chassis frame eliminates chance of dirt build-up. Weight (1500 lbs.) ordinarily used in a box frame is now centered over the crawlers.

Every model of the 14BU-10 has all these features; is designed to load more coal with less maintenance. Your Joy engineer has complete information on the 14BU-10, and can help you choose the proper model for your operation. Or write for Bulletin 1217-1.

BU-10 LOADERS



24" MACHINE A really low machine with high capacity; loads 10 to 12 tons per minute. Has a conveyor pan line only 14 inches high, the lowest in the industry, for loading out large lumps in seams as low as 28 inches. (Also available with a 24" wide conveyor—loader 6 inches narrower.)



38" MACHINE A heavy-duty machine for seams 44" and up. This model is designed for the rugged jobs where additional loading power is required. Has separate rear conveyor motors mounted on conveyor. Reversing conveyor permits independent operation of conveyor and gathering arms. Roller crawlers are standard equipment. (Also available is 38" machine without separate conveyor motors.)

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING MACHINERY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

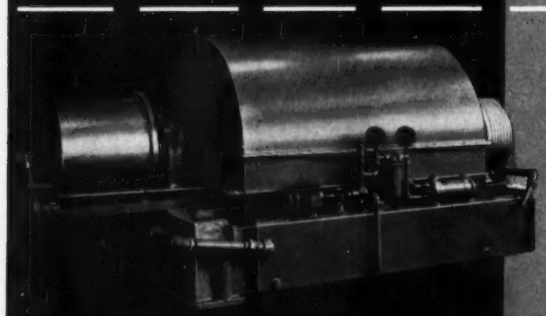
Why BIRD is your best bet for dewatering fine coal

Bird Screen and Bird Solid Bowl Centrifuges are proving their ability to do the job better and at lower cost in preparation plants throughout the industry.

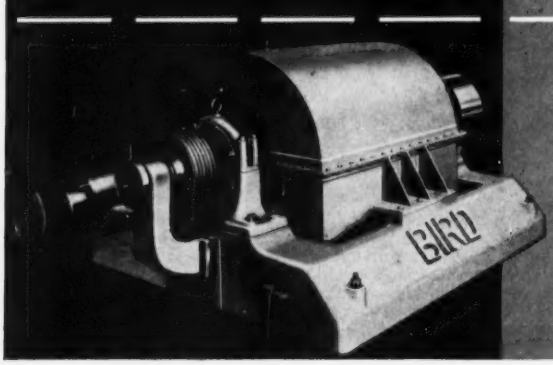
Bird Application Engineers are prepared to keep these machines doing their work successfully and economically not only at the start but year after year.

for 1" x ¼" mesh stoker size coal — *the Bird Humboldt Screen Centrifuge* delivers this size coal with no appreciable degradation and so dry it won't freeze (3% surface moisture or less). It occupies small space, requires only 0.2 KWH per ton. Screens last for thousands of hours.

for ⅜" x 28 mesh — *the Bird-Humboldt* takes the coal from the dewatering screens and delivers it at 5% surface moisture or less, with almost no degradation or loss of coal. Handling up to 80 tons per hour, over-all cost is less than 5 cents per ton.



for ⅜" x 0 table feeds — *the Bird Solid Bowl Centrifuge* takes the coal just as it comes, without pretreatment, gets it as dry as can be obtained by any combination of mechanical equipment, runs continuously for months with minimum attention at minimum cost.



for 28 mesh x 0 flotation concentrates or cyclone underflows — *the Bird Solid Bowl "Polisher"* employs centrifugal separating force to dewater these fines thoroughly and effect great savings in thermal drying cost. No auxiliary equipment. Overall cost seven cents or less per ton of dewatered fines.

Ask for recommendations, layouts, estimates

BIRD
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This Month in COAL AGE

JUNE, 1960

Features This Month:

Editorial: No Magic; Good Subject ..... p 71
P & M's Diamond Jubilee Story ..... p 72
Meeting the Challenge in Preparation ..... p 80
Mechanized Longwall in Morocco ..... p 88
U. S. Steel Opens Maple Creek Project ..... p 94
Automated Hoisting—An Integrated System From Car Haul to Surface ..... p 108
Maintenance Ideas ..... p 114

Spring Meetings:

West Virginia Coal Mining Institute ..... p 122
Indiana Coal Mining Institute ..... p 126
1960 AMC Coal Convention at Pittsburgh .... p 130

Departments This Month:

Coal Commentator p 11 News Roundup .. p 26
Foremen's Forum p 146 Operating Ideas . p 150
Equipment Developments ..... p 154

► Management Planning

P & M's Diamond Jubilee Story ..... *p 72*

W. A. Raleigh Jr., Associate Editor, *Coal Age*

In 1885, the Pittsburg & Midway Coal Mining Co. produced 15,276 tons; last year, 4,142,076 tons. Capacity, now in excess of 5,000,000 tons, is headed for 6,050,000 tons. Behind the P & M story: (1) aggressive leadership in pioneering more efficient methods and equipment for mining, preparing and marketing coal; (2) foresight in planning for continuity of management leadership, and in acquiring reserves to anticipate needs for replacing and expanding capacity; and (4) a deep-seated sense of loyalty and service to employees, customers and the community.

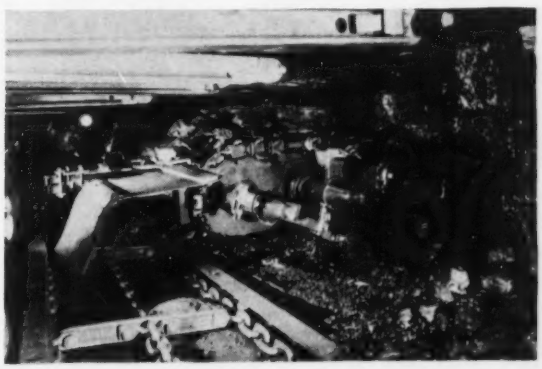
Highlights—Geographical and production growth; key management personnel; current operations pictured and described.

► Coal Preparation

Meeting the Challenge in Preparation . *p 80*

No. 2 plant, Jewell Ridge Coal Corp., produces 2,800 tpd of clean coal to specifications of 4.40% ash and 3% moisture. Jewell Ridge's quick response to the changing nature of coal preparation is evidenced in the new equipment additions that have been made in recent years. Latest stage of the improvement program was completed in 1959 with the addition of a fluid-bed dryer and 20 cyclones, a dewatering centrifuge, six double-deck wet tables, a 12-disc filter and the necessary auxiliary equipment. Increased flexibility and improved product, in cleaning coal from the 38-in Jewell seam, are results of the program.

Topper—Flowsheet shows how new equipment was designed into existing circuits.



► Longwalling

Mechanized Longwall in Morocco ..... *p 88*

Dr.-Ing. Karl Hartland, Fuengirola, Spain, consulting engineer to the Moroccan Ministry of Power.

Russian UKT-3 cutter loader is successful in 1½ to 2½ ft of coal. The machine is capable of simultaneous cutting and loading, it produces a good percentage of large sizes, it can be worked on broad faces and capital outlay is low. Performance averages show raw coal production of 230 tons per shift, or 17.7 tons per man shift for a crew of 13 men. This is approximately a one-third reduction in manpower as compared with conventional longwall mechanization and a two-thirds reduction compared to shooting and handloading.

Eye-catchers—Diagrams of layout and cutting patterns.

(Continued on p 7)

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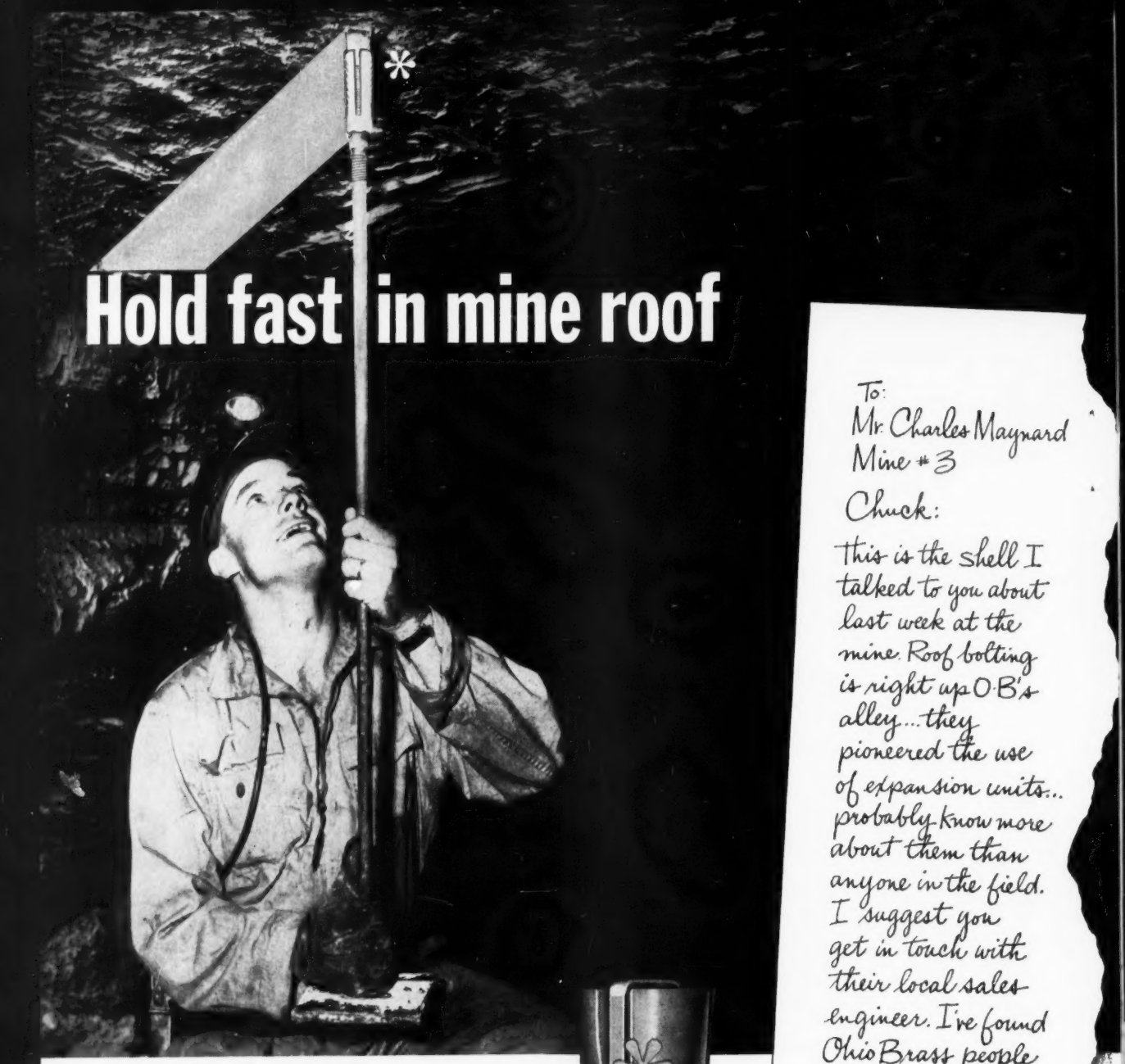
Postmaster: Please send Form 3579 to Coal Age, 330 W. 42nd St., New York 36, N. Y.

Hold fast in mine roof



To:
Mr. Charles Maynard
Mine #3

Chuck:

This is the shell I talked to you about last week at the mine. Roof bolting is right up O-B's alley... they pioneered the use of expansion units... probably know more about them than anyone in the field. I suggest you get in touch with their local sales engineer. I've found Ohio Brass people are glad to work right with you in the mine.

Regards.
Jack

Ohio Brass 4-Way Expanding Anchors hold in both soft shale and hard rock

GO UP FAST . . . 4-way expansion begins with the first turn of the wrench.

DEVELOP TOP HOLDING POWER with easy wrenching effort . . . 150 "foot pounds" of torque gives bolt tensions of 9000 pounds.

WORK IN CLOSE QUARTERS . . . O-B engineers developed these anchors underground. Personal knowledge of mining problems enabled them to design units that are especially suited to your needs.

GET SERVICE for your roof bolting problems . . . see your local Ohio Brass engineering representative or write Ohio Brass Company, Mansfield, Ohio.

O-B Bail Type Expansion Shell and Plug

Ohio Brass OB HOLAN

EXPANSION SHELLS AND PLUGS · LINE MATERIALS · SAFETY AND CONTROL EQUIPMENT · ELECTRIC HAULAGE MATERIALS

Preparation, Mine Planning

U. S. Steel Opens Maple Creek Project . . p 94

A. E. Flowers, Associate Editor, *Coal Age*

Maple Creek mine and preparation plant, U. S. Steel's new, big property at New Eagle, Pa., stands out as an example of modern architectural design for the coal industry. Design incorporates suggestions from community leaders with regard to refuse disposal, noise abatement and so on. Maple Creek boasts the first application of tubular, prefabricated conveyor galleries in any industry. Refuse is transported 3½ mi at a rate of 21 tph through a 5-in pipeline. Maple Creek is the first AC deep mine in Pennsylvania, employing continuous mining machines to produce coal from a 17,000-acre tract of the Pittsburgh seam. River shipment of the product to the Clairton Works is planned.

Idea Bank—Applications of special steels and alloys to combat corrosion and abrasion in coal-handling circuits.

Shaft Hoisting

Automated Hoisting—An Integrated System From Car Haul to Surface . . . . . p 108

W. J. McDonald, Application Engineer, General Electric Co., and **J. Erskine,** Chief Electrical Engineer, Eastern Gas & Fuel Associates, Inc.

Fully-automated hoist at Federal No. 1 mine, Eastern Gas & Fuel Associates, is designed to raise 880 tph without supervision or manual operation. The cycle is automatically programmed from the car haul at the foot of the shaft, through the car-dumping step, thence to skip loading and unloading. Electrical equipment includes a 900-hp synchronous motor to drive two 400-kw generators and two 400-hp DC motors to drive the 10-ft hoist drum.

Special—Detailed explanation of automatic control circuits.

Maintenance Ideas

Preventive Maintenance of Mercury-Arc Rectifiers . . . . . p 114

Calvin H. Furfari, Consulting and Application Engineer, Westinghouse Electric Corp., Pittsburgh, Pa.

A good preventive-maintenance program for mercury-arc rectifiers will more than pay for itself in reduced maintenance cost, and more important, in reduced outage time and production loss. Although the rectifier requires little maintenance a PM program is still

This month in COAL

GAINS AND LOSSES—Gains finally for bituminous but continued losses for anthracite marked production developments in April and May. Bituminous, on the basis of weekly estimates, turned the corner the week ended April 16, and since has been increasing its lead, in spite of minor setback from time to time, though the gains still are on the modest side. After the vacation period the tempo should pick up, since it probably will be clear by that time that the economy is in for a good year.

For anthracite it was the old, old story of warmer-than-normal weather and more gains by competition. It now remains for the last half to show whether the loss rate can be cut much under 10%.

MORE VOTES FOR COAL—From TVA to U. S. Steel the picture of growing reliance on coal becomes sharper and sharper. TVA has gone so far as to option 60,000 acres of coal in southeastern Kentucky to assure a stable supply in the future, while U. S. Steel has increased its holdings by contracting to buy a producer and its reserves in Western Canada. And at Lake DeSmet, in Wyoming, preliminary work aimed at developing new production for power is already underway. As business picks up and the future becomes more solid, look for an increase in this type of activity.

BEEHIVES TO THE FRONT—Announcement of another modern-type beehive plant for Kentucky, to be built and operated by the Kemmerer interests, points up, among others, these trends: (1) the continued reliance of the steel and foundry industries on coke, and (2) the changing economic picture for that product. Now, with the by-product market fairly well saturated—at least for some products—it becomes logical to cut plant investment and final coke cost by concentrating on coke alone. Barring a change in the economic picture, by-product recovery installations probably will be few and far between for some years to come.

THE GOVERNMENT FRONT—A major effort by coal to get a new deal on oil-import regulations probably will prevent any further relaxation—at least for a time—but the chances of getting back to the original setup were less than fair at the time of this report. In Congress, new fuels policy resolutions firmed up coal's stand against end-use control of fuels, but prospects of passage of the proposals were and are not too favorable. And in another direction—safety—it also seemed unlikely that Congress would put mines employing less than 15 men under even modified federal supervision. And chances of any particular tax relief grow less as well.

THE BIG THREE—Constituting, as they do, the backbone of business for coal, a look at utilities, steel and general industry always is in order—particularly as the economy gets ready to go into the second half. Basically, business is good and will remain good. Consequently, even though steel will not hit any peaks, all of the Big Three should do pretty well in the months to come. For coal, therefore, the second half should be appreciably better than the first.

EATON PLANETARY DOUBLE REDUCTION AXLES

SAVE WEIGHT
LAST LONGER
REDUCE MAINTENANCE

1. **FIRST REDUCTION** in bevel gears
2. **SECOND REDUCTION** in planetary gears

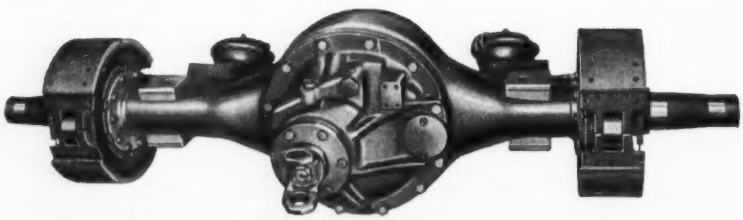
Eaton PDR Axles have established outstanding performance records in all types of heavy-duty operation. By actual comparison, they cost less to buy, less to maintain.

Ask your truck dealer for complete information about Eaton PDR Axles.

Because Eaton PDR Axles weigh less (size for size) than conventional herringbone or spur gear axles, PDR-equipped trucks haul more legal payload.

Two exclusive Eaton design features contribute to materially longer axle life: Gear tooth loads are distributed over four rugged "planet" gears, reducing stress and wear; the Eaton forced-flow lubricating system provides positive lubrication to all moving parts, even at slowest vehicle speeds.

Simple construction—similar to the famous Eaton 2-Speed Axle which is familiar to all truck servicemen—holds maintenance cost to a minimum. Repair parts are readily available—many of them interchangeable with other Eaton Axles.



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More than
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in Trucks Today

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AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND 10, OHIO

essential for maximum operation. This article covers daily and weekly inspections and spring and fall servicing, plus yearly servicing requirements.

Glossary of Electrical Terms ..... *p 115*

This list of electrical terms gives the correct definitions of the terminology used in discussing the function, operation and maintenance of rectifiers.

How to Make Good Electrical Connections p 117

The use of an air-acetylene torch to solder copper wires, attach lugs and clips and make permanent, safe connections will assure you of good electrical contacts. This feature offers several hints for making better connections.

D. C. McGRAW Jr., Publisher IVAN A. GIVEN, Editor

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This Month in Mining Practice

WHEEL BENCHING—As a result of the long, costly and at times painful pioneer work the wheel now seems to be destined for a much bigger role in stripping and open-cut work. Among other things, modifications are cutting initial wheel cost and making it more adaptable to a wider variety of conditions. Adding it all up, the wheel is destined to become a rather familiar tool in coal stripping in the relatively near future.

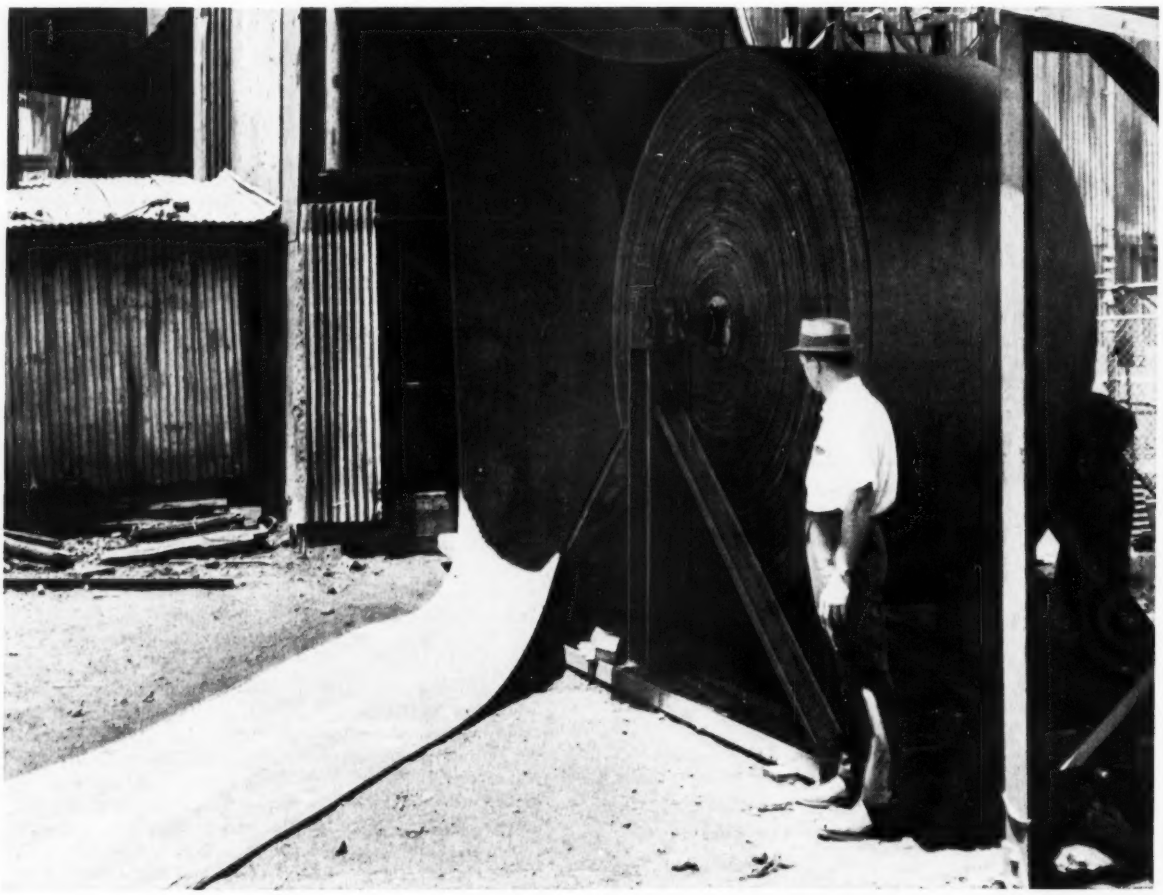
CONTINUOUS SHOOTING—After being under wraps for several years the idea of continuous drilling and shooting of a coal face has been outlined in a public industry meeting, perhaps signifying that its backers are becoming reasonably sure that it is a practicable tool. Basically, the process involves releasing a gas through a rupture disk and ports in the drill to break coal previously cut and sheared by a continuous-type machine. As with hydraulic mining, some time must still elapse before it becomes a commercial system, though it is now quite a bit more certain that it will eventually attain that state.

COMPUTER BLENDING—Attaining a high degree of uniformity of product steadily becomes more difficult in coal production in spite of the increased precision of washing equipment. The need for blending is of course greatest where the application is metallurgical but in the drive to protect other markets—utility, for example—blending may become an additional tool to insure maximum customer satisfaction. But blending benefits may be lost without precision and as the number of coals, and the variations in characteristics of each, increase the problem becomes intensified. But another modern gadget stands ready to come to the rescue. It is the computer, and it and its brothers and cousins among the business machines will be more and more used—and will provide more and more benefits.

MORE RATHER THAN LESS—What the ultimate will be in number and arrangement of bits for boring-type continuous miners no one can as yet say. But study and field experience are beginning to result in some modifications of widely held ideas. For instance, some producers are finding that increasing the length of the cutting edge and in consequence the number of bits is increasing output and reducing bit cost and holder maintenance—at least under their conditions.

CHEAPER, MORE EFFECTIVE—The face still is the place where the big opportunities are for cutting cost. But there are others—for example, mechanized tie tamping, mobile cranes in supply yards, etc. Now a new rockduster and a new rockdusting system promise major economies in that field as well. The heart is a machine in which the dust is fluidized with air for movement to the nozzle. Backed up by bulk-handling facilities, including transfer units employing the same fluidizing principle, the system provides almost the ultimate in low-cost application. Even without bulk handling the new duster applies up to 3 to 4 times the dust with as little as one-fourth or one-fifth the labor—in itself no mean saving.

US RUBBER CONVEYOR BELT



OFF WITH THE OLD, ON WITH THE NEW

20-year "U.S." veteran makes way for new "U.S." Belt

Here's why: This was a "Haul of Fame" slope belt in performance—every foot of the way. Installed in Sahara Coal Company's Mine No. 5 (Harrisburg, Ill.) over 20 years ago, this U. S. Matchless® 54" slope belt was replaced by a new U. S. Matchless.

In the 20 years, the old belt carried over 13 million tons of raw coal, plus well over a million tons of rock.

This enviable record is typical of the kind of service obtained with U. S. Conveyor Belts. The Sahara Coal Company pioneered with U. S. Rubber in the design and installation of both slope and underground belts to deliver lowest ton-per-dollar and not a belt at-a-price.

• • •

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

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United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

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The Coal Commentator

Potent Convincer

Aside from its very practical appeal to those in position to benefit—to wit, the customer—coal probably has in its cost-cutting achievements a public-relations tool whose effectiveness it hardly yet realizes.

The fact that bituminous coal has been able to cut its price in the past 10 yr in spite of major increases in the cost of everything it buys, including labor, is almost completely unknown outside the industry—and perhaps not too well known even inside. When it is made known, particularly to noncoal people, the impact is immediate and major. This is as it should be, since it is an achievement matched by probably no other industry except the electric utilities.

This fact is something that people find easy to understand, and they have no trouble coming to the conclusion that it is unique. **It is inevitable that the industry gets viewed in a new and more favorable light.**

Big Strippers

When you go about pricing big stripping equipment you begin to think in terms of 55 to 65¢ per pound of final operating weight. This applies even to the super machines which already are offered with dippers up to 110 to 130 yd, depending on boom length, and, in the case of draglines, with buckets up to 45 yd, again depending on boom length. And the builders say that all that is necessary to put a 150-cu yd or bigger machine in the field is an order.

What happens if you want one, say, half size. The price per pound is not too different, meaning that the super jobs do not cost significantly more in terms of dollars per million yards of uncovering capacity. In addition, the big ones can handle overburden up to 50% thicker with no more loss of capacity than the smaller units operating at their extreme ranges.

This is one of the reasons why stripping continues to make headway in coal mining. Since bigger equipment does not involve significant extra investment per unit of capacity, the limit becomes the overburden range that can be handled economically—and even that is being pushed up by new designs for shovels, draglines and auxiliaries, such as, the wheel.

How Many?

A big reason for a multiplicity of headings in an entry setup theoretically is higher efficiency through more working places. Airway area also is an objective but normally the requirements can be met with a smaller number of openings.

If the top is bad and heavy caving results, the validity of the argument for more openings, especially with today's machine may be open to question. Other extra expenses may be incurred, but beyond all that the evidence indicates the primary objective of the multiple opening—higher unit output and efficiency—frequently is not attained.

This is not to infer or imply that extra openings are bad per se. Rather, if they are driven with the aim of raising unit productivity to more than offset the disadvantages that may ensue, management should make sure that that goal is reached.

Sandy Grant

When your Commentator was a lot wetter around the ears than he is now—in fact before he escaped mining school—one of the first people he had the privilege of encountering in the industry was Alex Grant, known far and wide as "Sandy." Now, after a lifetime in coal, more recently as manager of coal mines for the Youngstown Sheet & Tube Co., Sandy hangs up his hard hat and prepares to take it a little easier.

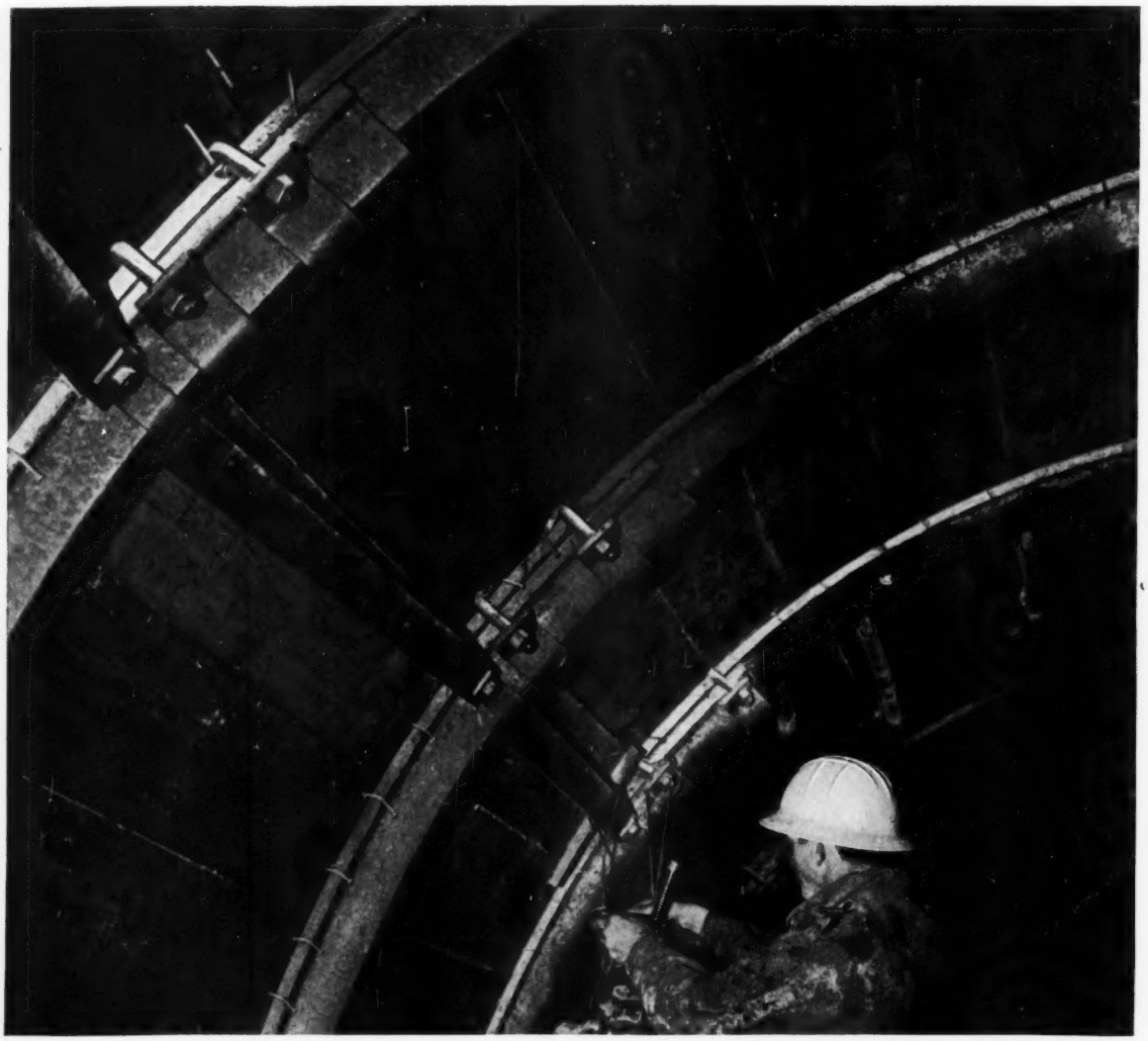
Sandy is of the Scottish group that has exerted major influence on coal mining here. His contributions began when he arrived from his native land in 1913, and have included in addition to management a dedicated interest in safety and an equally dedicated interest in helping people, such as your Commentator, get a start and grow in coal.

On any basis of judgment, Sandy's career is one of distinction, and as he prepares for a less-strenuous life he takes with him the best wishes of a host of men within and without the industry.

"Wacky World"

As could be expected from its size and the vital role it plays in the economy and well being of the Nation the United States Steel Corp., at any one moment, is likely to be engaged in a wide variety of activities. For example, it displayed a new coal-mining operation—Maple Creek—to its directors and the press early in May, and a week or so earlier, in contrast, came out with a provocative pamphlet whose title included the words heading this item. Full title: "The Wonderful Wacky World of Sleep . . . And How to Buy the Stuff It's Made Of."

The Maple Creek story will be a feature of the next month's **Coal Age,** and a note to U. S. Steel, at Pittsburgh, will get you a copy of "Wacky World." The copy is a pleasure to read and practical, too. **If it should persuade you to improve your sleeping machine, you'll be a better man for having had better rest, and the materials that would go into it would give coal one of those extra little lifts that, combined with all the others, would mean a little faster progress towards a much bigger market.**



Surrender Means Victory . . . with Bethlehem's Yieldable Arch

No rigid support, however strong, can forever withstand the squeezing pressures of heavy or shifting ground. The best way to control these forces is by "surrendering" a little at a time, allowing the overburden to settle naturally into a pressure arch.

The Yieldable Arch does just that. Each Arch (or Ring) is made up of segmental steel sections, overlapped at the ends as shown in the photograph. Secured around the lapped joints are husky U-bolt clamps, which are drawn up tightly enough to hold fast under normal loads. As pressures bear down, friction in the joints is overcome and the joints yield a little. This "give" transfers the stress to the surrounding material, until gradually, equilibrium is reached. At this point, the Yieldable Arch holds the line, its structural integrity maintained and mine safety preserved. After the area is mined out, you can usually take down the Arch sets and re-use them elsewhere in the mine.

Many installations of Yieldable Arches and Rings have paid for themselves within a matter of months! A Bethlehem engineer would like to discuss the full story in terms of your own special conditions. If you're interested, by all means get in touch with us.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

Steel — *for Strength . . . Economy . . . Versatility*

BETHLEHEM STEEL

BETHLEHEM STEEL

Where do you find a belt capable of lifting 1680 T.P.H. 807 feet? Management of this big new Central States coal mine approached many conveyor belt manufacturers but it was the G.T.M.—Goodyear Technical Man—and his colleagues who came up with the best answer. Their recommendation—a Compass 600 Belt—steel cable reinforced for the highest unit tension ever demanded of a belt. Its rated working tension of 2260 lbs., per inch of width, is a world's record. And this 6,190 footer is driven at 625 f.p.m. by two 800 h.p. motors. What's more, this giant belt is only one of 17 Goodyear belts that help make this mine one of the most modern and efficient in the world.

No industrial rubber problem is too big — or too small—when the G.T.M. gets the call.

To cash in on this vast background and problem-erasing knowledge — and to get the finest Hose, V-Belts and other industrial products—contact your Goodyear Distributor. He's listed under "Rubber Goods" or "Rubber Products" in the Yellow Pages. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

Lots of good things come from

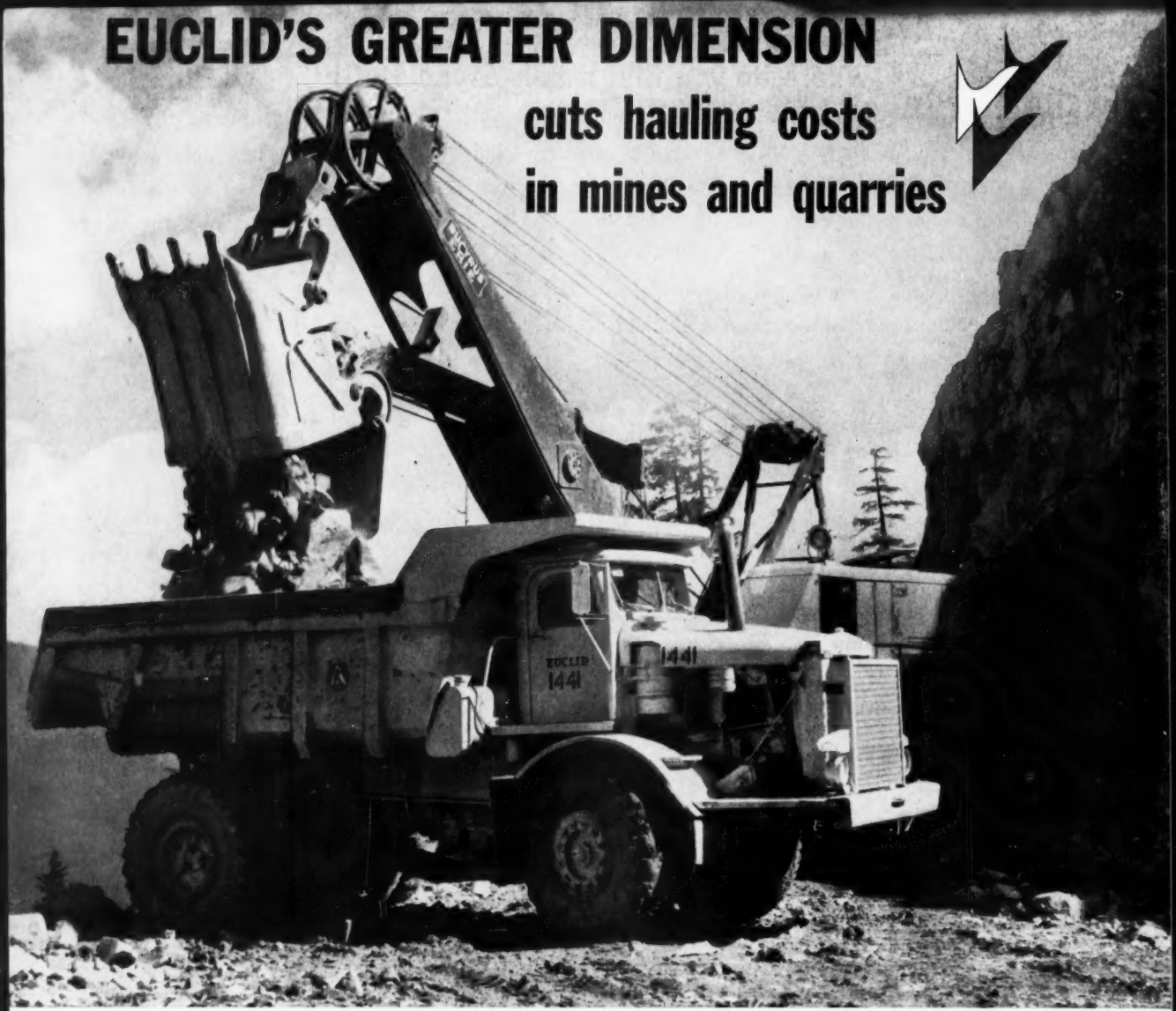
GOODYEAR

Compass—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

THE GREATEST NAME IN RUBBER

EUCLID'S GREATER DIMENSION

cuts hauling costs in mines and quarries



Model R-27 has rated payload of 54,000 lbs. and a heaped capacity of 26½ yds. . . . available with Cummins 335 h.p. and GM 336 h.p. engine . . . 4-speed Torqmatic Drive with converter lock-up and Torqmatic Brake . . . dual hydraulic booster steering . . . 18.00 x 25 tires on all wheels . . . rugged body with twin hoists . . . top speed with full payload, 34 mph.

Backed by better than 25 years of specialized experience in building off-highway earthmoving equipment exclusively, Euclid's modern rear-dump line incorporates advanced engineering that is a result of unmatched field experience. From the 10-ton Model R-10 to the big 55-ton "Euc" with two engines and a total of 672 h.p., Euclid Rear-Dumps meet today's requirements for big performance.

This greater dimension . . . in a wide range of capacities, in choice of engines, transmissions, tire sizes, and in type of hauler . . . in the parts and service facilities of Euclid's world-wide dealer organization, too . . . can mean lower hauling costs on mine and quarry work.

EUCLID Division of General Motors, Cleveland 17, Ohio
Euclid (Great Britain) Ltd., Lanarkshire, Scotland

A complete line of rear-dumps with payload capacities of 10, 15, 18, 22, 27, 40 and 55 tons . . . also semi-trailer models of 12, 22, 35 and 50-ton capacity.

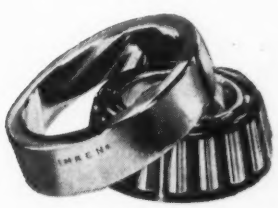
GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

THERE are two big reasons why the trade-mark "Timken" guarantees top bearing value. 1) It assures you of uniform high quality and performance. From the steel right through to final inspection, Timken® bearings are made to the industry's most exacting specifications. 2) You're assured of the finest bearing service available.

"Timken" is the registered trade-mark that identifies tapered roller bearings, fine alloy steel and removable rock bits made by The Timken Roller Bearing Company. For your guarantee of value, specify "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Canadian Division: Canadian Timken, St. Thomas, Ontario.

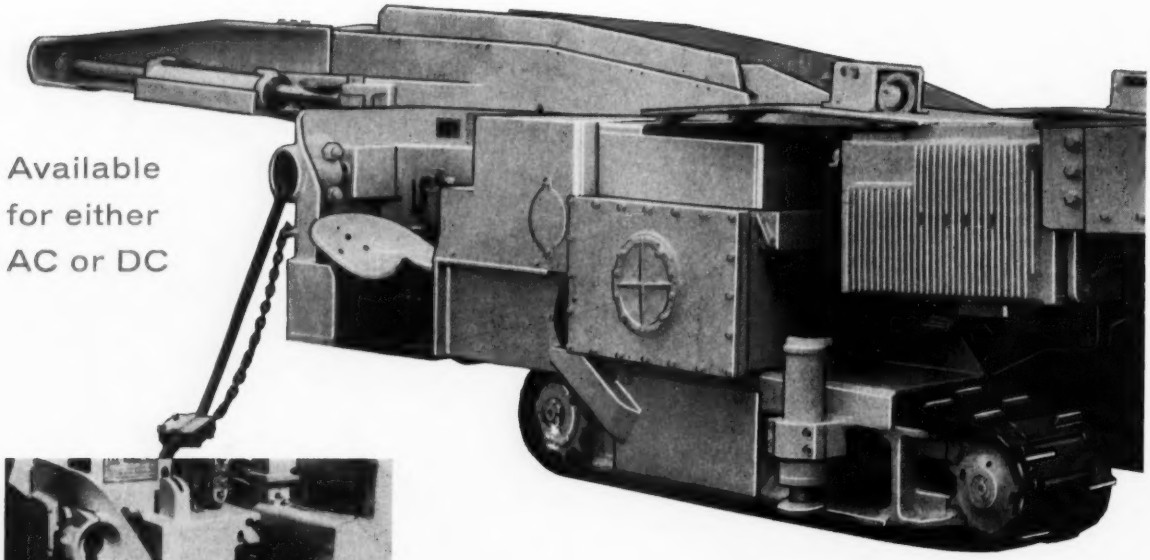


Industry rolls on

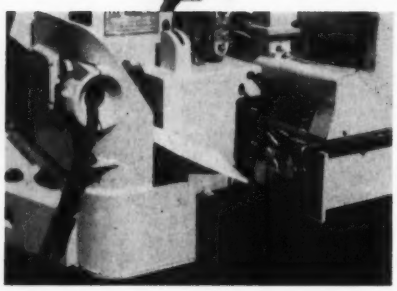
TIMKEN®

tapered roller bearings

LIGHTWEIGHT COST *plus* HEAVYWEIGHT *equals* PRODUCTION



Available for either AC or DC



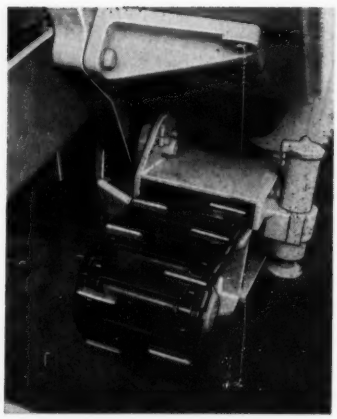
OPERATOR'S PLATFORM

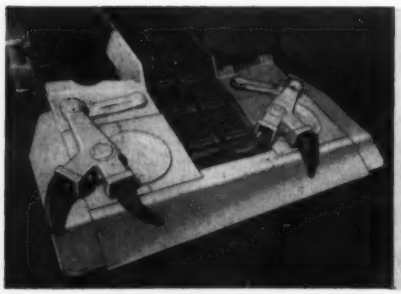
Compact and convenient hydraulic and electrical controls are within easy reach of the operator. Throttle valve precisely controls the speed of all hydraulic operations as well as providing "deadman" control.

16″ WIDE CRAWLER

The new crawler with heavy-duty gearing can operate the miner on steep grades and also float on soft bottom.

Less than 25 P.S.I. ground pressure.





GATHERING HEAD

The exclusive "dual gathering arms" provide maximum reach and much better flow to the conveyor.

PERFORMANCE PUNCH

Lee-Norse CM38 and CM48 MINERS

29 TONS with power-smooth cutter-action that cuts 42" to 120" seams and gathers loads as fast as they are cut

CUTTING HEADS

New "Rap-Lok*" Cutter Bits, spaced evenly around cutter rim, provides smooth, vibrationless performance. Extremely quick "bit change"—no set screws—long bit life.

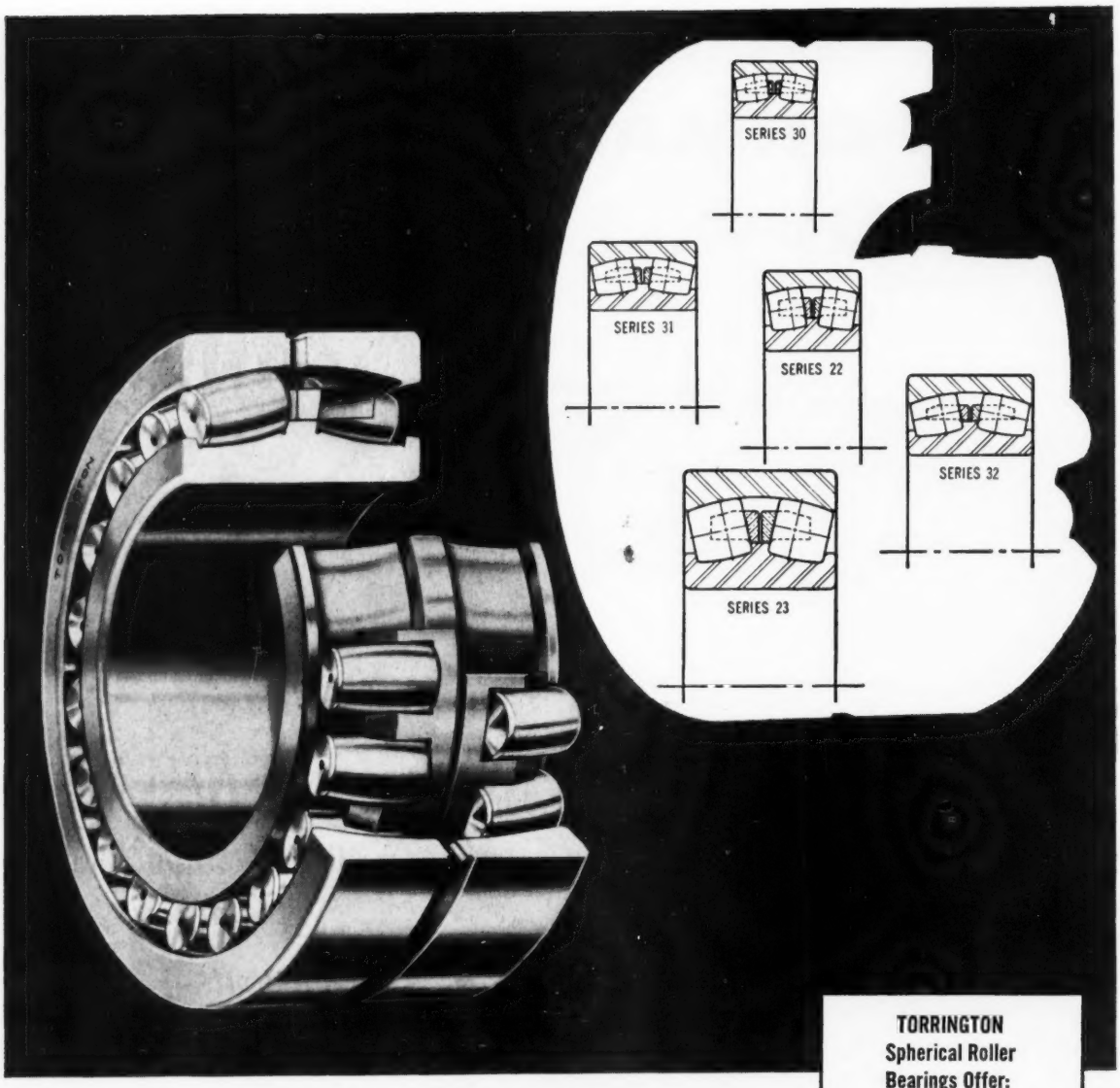
*Trade Mark of The Cincinnati Mine Machinery Co.

Lee-Norse Company

CHARLEROI, PENNA.

Specialists in Coal Mining Equipment

Coal high or low?... Lee-Norse MINERS keep production on the go!



There's a Torrington Spherical Roller Bearing for your application

Bearings matched *exactly* to the job pay off in better performance, longer life, greater reliability. That's why it pays to specify carefully. And that's why it pays to choose Torrington Spherical Roller Bearings.

Whatever your space limitations or capacity requirements, the five series of Torrington Spherical Roller Bearings provide the right bearing for virtually every industrial application. You can design for straight bore or tapered bore with adapter. You can benefit from extra features such as lubrication groove and oil holes, or selected outside diameters.

Your use of Torrington Spherical Roller Bearings will assure exceptional operation and longer bearing life under the toughest conditions. They're made to Torrington's own uncompromising standards—the highest in the field of anti-friction engineering—by the manufacturer of every basic type of anti-friction bearing.

TORRINGTON Spherical Roller Bearings Offer:

- conformity of rollers to raceways
- integral center guide flange for stability
- positive roller guidance
- land-riding bronze cages
- maximum radial and thrust capacity
- controlled internal clearance
- electronically selected rollers
- inherent self-alignment
- even load distribution
- long, dependable service life

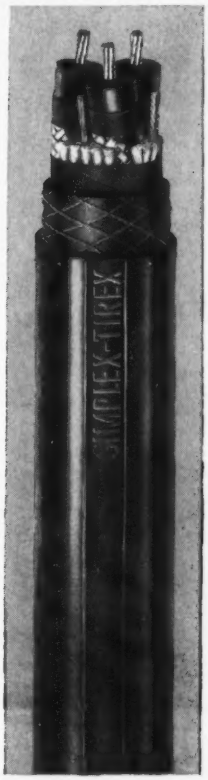
Send for new Torrington Spherical Roller Bearing Catalog #258

progress through precision **TORRINGTON BEARINGS**

THE TORRINGTON COMPANY South Bend 21, Indiana • Torrington, Conn.

Simplex **TIREX**

BALANCED COMPOUNDING means BALANCED RESISTANCE



. . . to all of the factors that attack portable cables and cords

It is not enough that portable cables or cords have the ability to resist attacks by water or oil, or any other single factor. To provide truly dependable service over long periods of time, portable cables must have balanced resistance to *all* deteriorating factors.

Since there is no one ingredient that has inherent resistance to all of these factors, the insulation or jacket of the portable cable or cord must be a combination of ingredients.

Balanced Compounding refers to the scientific selection of these ingredients and the proportions in which they are mixed. Where the balance is upset by loading the compound with any *one* ingredient, resistance to *one* factor *may* increase, *but resistance to other factors will be lessened.*

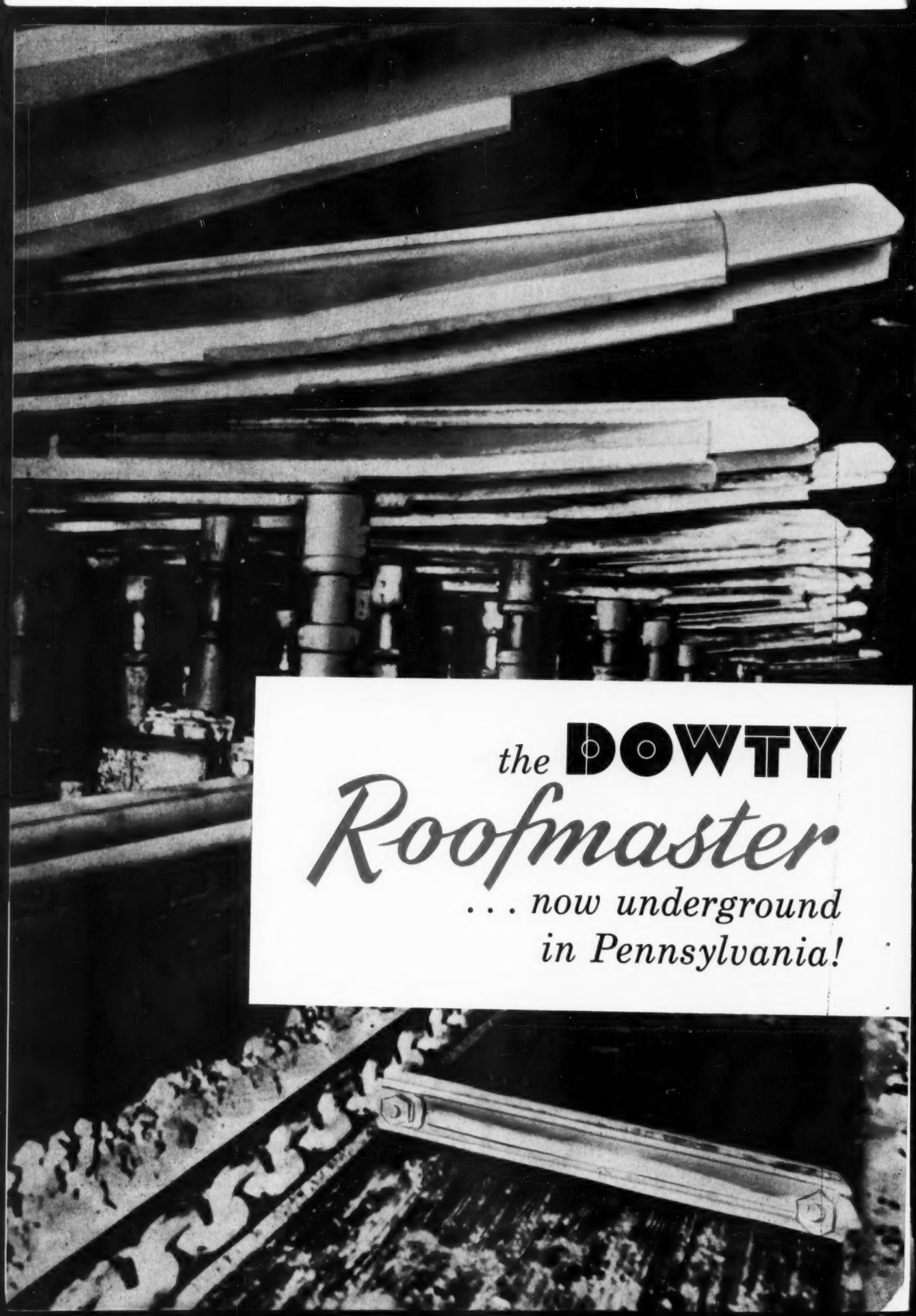
Proof of the worth of Simplex Balanced Compounding can be found in the fact that Tirex portable cables have been successfully performing under the most rugged operating conditions for periods ranging up to twenty years.

Simplex

BALANCED COMPOUNDING CURED IN LEAD

WIRE & CABLE CO.

Cambridge, Mass. • Newington, N. H.


the DOWTY
Roofmaster
. . . now underground
in Pennsylvania!

400 ft. longwall face mined with fully mechanized "push button" roof control **system**

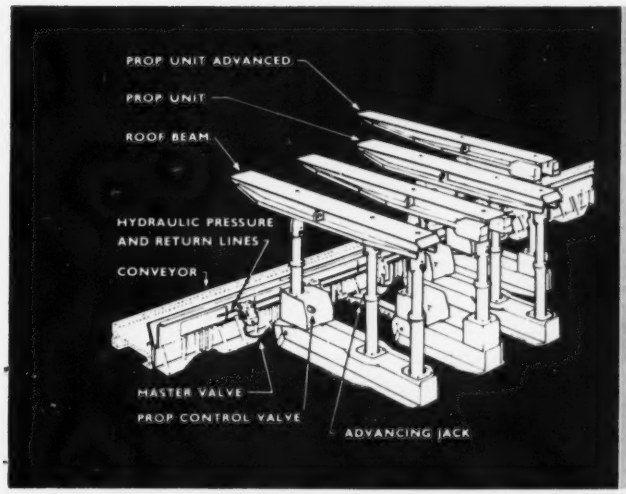
The DOWTY *Roofmaster* is now making *practical* all the "theoretical" advantages of *longwall mining* . . . positive, continuous operations . . . no moving from place to place . . . concentration of output and haulage . . . simplicity of ventilation . . . *high output per man and low cost per ton.*

The new production-boosting *Roofmaster* system is now operating on a 400-ft. longwall coal face in Central Pennsylvania. It is a self-advancing, hydraulic-powered roof support system used with a shearer continuous miner and snaking conveyor.

With the *Roofmaster* system, *all functions* of roof control on the longwall face are performed by two men! The total face crew of five to seven men is expected to produce 600 or more tons of coal per shift on a 3½-ft. seam.

Conditions throughout bituminous areas are favorable for conversion to longwall with the DOWTY *Roofmaster* system. Greater production — greater safety — greater profits . . . these are the rich rewards attainable.

Skilled and experienced DOWTY engineers are available to survey the longwall potential of your mine, and provide comprehensive reports without obligation.



The DOWTY *Roofmaster* consists of self-advancing, hydraulic-powered double and triple-prop support units. Only two men are required for continuous operation of 200 support units.

WORLD PIONEERS OF HYDRAULICS FOR MINING

DOWTY

MINING LIMITED

90 Broad Street, N. Y. 4, N. Y. • Telephone Digby 4-6876

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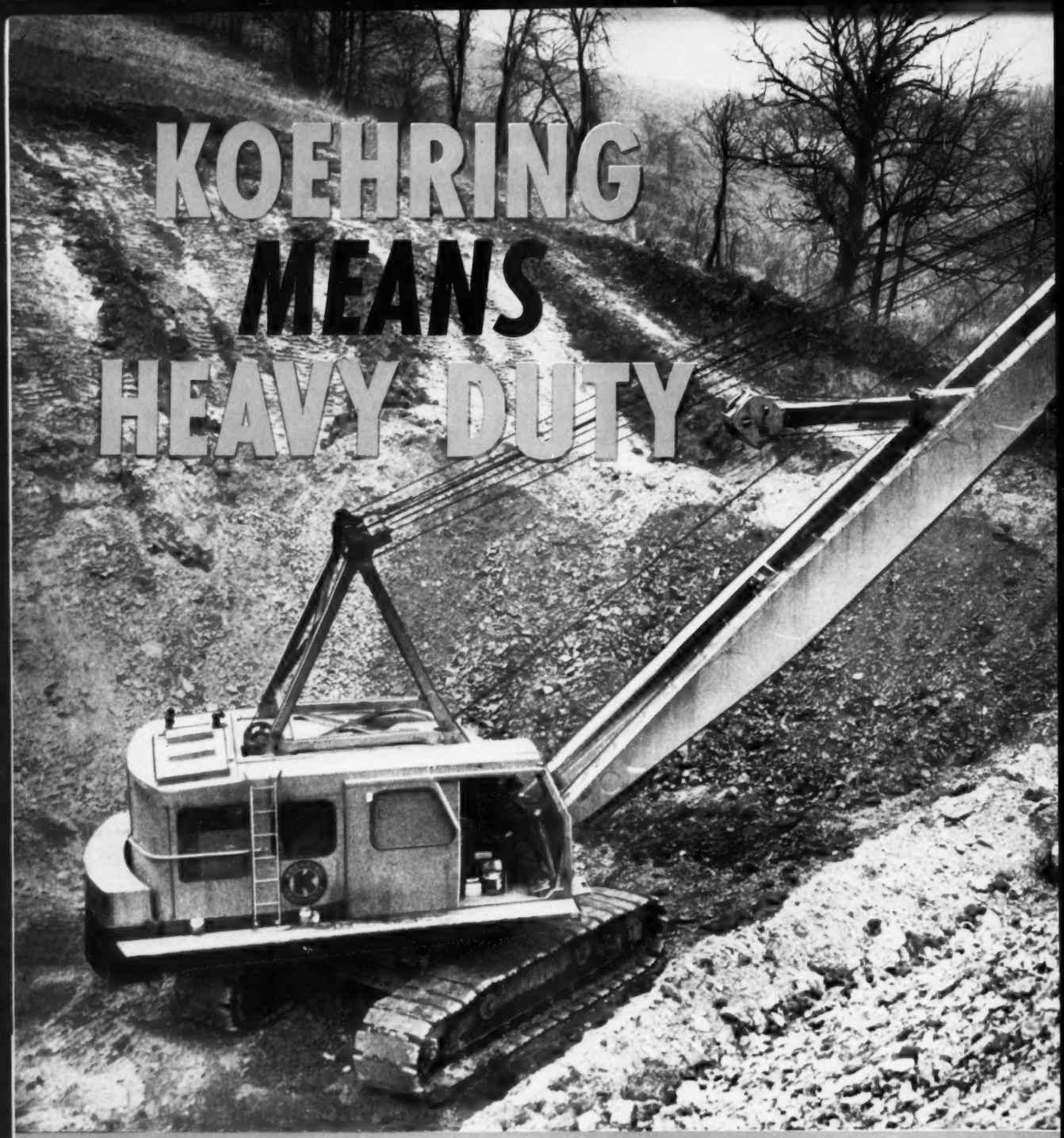
"Dowty Service Is Your Guarantee"



The words "HEAVY DUTY" are an important part of the Koehring trademark . . . have been for years. And there's a mighty good reason: Koehring excavators have proved through millions of hours of service that you can count on them to outproduce and outlast other makes even under the most severe digging conditions. They're *heavy duty* through and through.

Take the front end of the 1205 stripper. With a 3-yd. dipper, digging height is 42' 10", dumping height, 31' 5" (40' boom at 45° angle). You get long range capacity and low maintenance because the front end consists of a twin box frame boom connected by sturdy torque tubes, twin large diameter boom point sheaves, and a strong box section welded dipper stick . . . real *heavy duty* dependability at the business end. Or take the crawlers. Each individual shoe is actually strong enough to support the entire machine plus its rated load. Or take the main machinery. Shafts are kept in perfect alignment because integral side stands are line bored in place as a unit.

Yes, Koehring *means* Heavy Duty. That's why you can *expect* more from a Koehring excavator . . . why you *get* more from a Koehring. See your Koehring distributor for more details on the Koehring heavy duty story.

▲ Koehring 205 Skooper has 7' level crowd . . . tremendous breakout ability for digging and loading stripped coal. Bucket capacity: 2 yards. Clearance height at end of dump: 10' 5". There's nothing like it on wheels or tracks.

▼ Koehring 605 Dragline is a high production — low-cost per yard unit. Can be used with 50 to 110 feet of boom — with 1½ to 2½ cubic yard dragline bucket.

KOEHRING HEAVY DUTY

KOEHRING

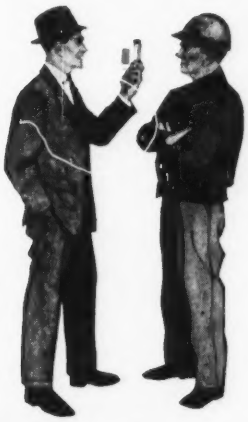
DIVISION OF KOEHRING COMPANY

Milwaukee 16, Wisconsin

More Work Capacity . . . More Profit Per Dollar Invested!

K29

RED, HOT AND STANDARD



NEW

With the Big 7 features to give you better engine performance and lower maintenance costs

Here's how you get better engine performance

Balanced volatility gives you maximum usable power. It allows PREMIER Diesel Fuel to deliver the most possible BTU's of energy without sacrificing clean-burning qualities, meanwhile assuring low smoke and exhaust odor. PREMIER'S low pour point means free flow in cold weather. PREMIER'S cetane means that engines start easily, idle smoothly, deliver full performance under all operating conditions.

PREMIER'S anti-rust additive minimizes an important diesel engine worry—injector sticking. PREMIER Diesel Fuel is handled only by Standard Oil from refinery to you, thus the chance of fuel contamination is virtually eliminated.

Here's how you get lower maintenance costs

Deposits caused by excessive sulfur in fuel can damage the engine and increase maintenance costs. PREMIER'S low sulfur content means reduced engine wear. Additives inhibit rust of engine parts and storage facilities. PREMIER'S just-right viscosity results in effective injector lubrication and the prevention of leakage. Because of this you don't waste fuel or power.

Get all the facts about new PREMIER Diesel Fuel. Call your nearby Standard Oil office. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

PREMIER DIESEL FUEL

Here are the 7 big features

1. Anti-rust additive.
2. Balanced volatility—for full power and clean burning.
3. Cetane—for easy starting, good performance.
4. Free flowing—even in cold weather.
5. Low sulfur—less wear, reduced deposits.
6. Lubricates and seals injectors.
7. Distinctive red color.

You expect more from STANDARD *and you get it!*

News Roundup

Top-Grade Talent

Forward-Looking Policy

New Modern Building

Improved Communications

NCA chief, Stephen Dunn (right) greets James Garvey, new research director.

These are the factors which mark the . . .

New Look at NCA

THE SELECTION of James R. Garvey (top right) as director of research for the National Coal Association follows hard on the heels of other appointments NCA has made this year.

This move, and other rapid-fire changes at NCA, signal the reshaping and strengthening of the organization as it steps out to lead coal's drive for a bigger bite of its present and potential markets.

The hustle and bustle of the "new-look" NCA causes one to recall the words of F. Stillman Elfred, president, Peabody Coal Co., and chairman of the board of the association, when he addressed a group of coal men in November, 1959. He said, "We will give you within two years an organization comparable to the very best possible, an organization that will more than prove its worth to you."

Organizing—Mr. Elfred and his associates moved fast. Six departments were designated, all in areas vital to coal's future health and growth: fiscal management, government relations, marketing, public relations, research, and transportation. NCA chose Stephen F. Dunn as president to oversee these divisions. Mr. Dunn has had vast experience in government, labor and management relations.

Shortly thereafter, The Bituminous Coal Institute was merged with NCA, and the American Coal Sales Association was absorbed. This solidification gives the new organization a broader base and more united approach in handling coal's problems and affairs.

OFFICIALS of first three Alaskan coal firms in NCA pay a visit to new headquarters. Left to right are: William Waugaman, general manager, Usibelli Coal Mine, Inc., Fairbanks; Harry Gandy, Jr., NCA Membership Dept. Julius Moor, secretary-treasurer, Mrak Coal Co., Palmer; Alan G. Horton, president, Evan Jones Coal Co., Anchorage; and Tom Howarth, secretary - assistant treasurer NCA.

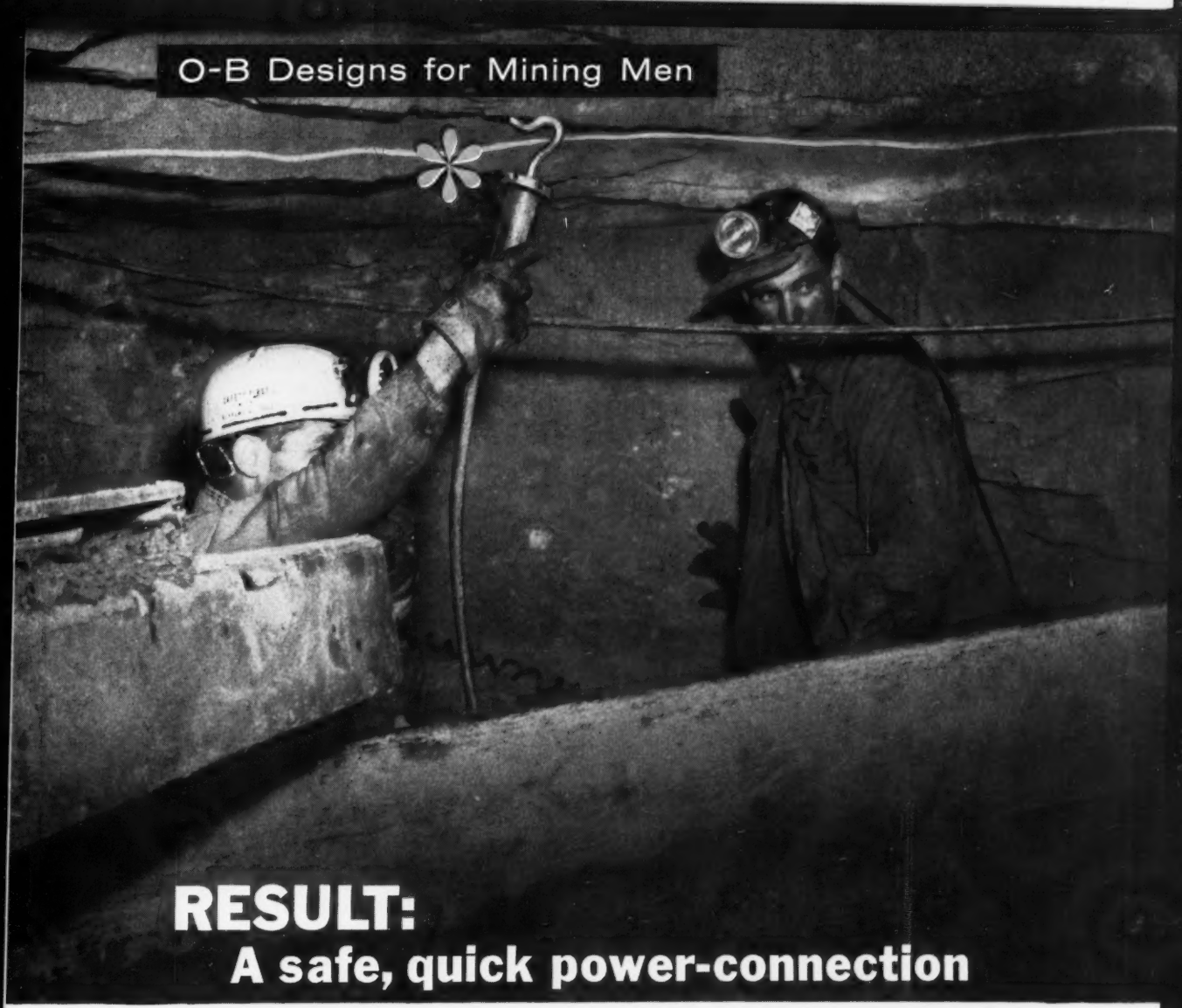
Getting Talent—The plans laid, Mr. Dunn and NCA went to work in recruiting top talent. Carroll F. Hardy, former managing director of BCI, was named director of the new BCI division. Mr. Hardy is the author or co-author of some 100 technical articles, pamphlets on subjects about, or related to, coal.

To head an important new Manpower Development Div., Paul L. Brown, former professor of marketing at the University of North Carolina and Ohio State University, was brought in. Mr. Brown

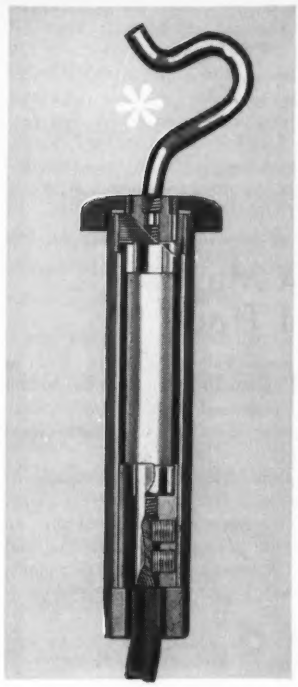
In This Section

People in Coal ..... p 38
Coal Abroad ..... p 46
Equipment Approvals ..... p 47
Current Coal Patents ..... p 50
Mines and Companies ..... p 64
Utilization ..... p 64
Preparation Facilities ..... p 64
Coming Meetings ..... p 64

News Roundup (Continued)



RESULT:
A safe, quick power-connection



for portable equipment in fast mining operations.

O-B FUSED TAP HOOKS UP FAST with a wide selection of contacts—hook, clamp, plier-type or other standard types. The O-B unit will allow you to put power to work . . . quickly and safely . . . right where you need it!

PROTECTS MEN AND EQUIPMENT . . . cuts power off the line when trouble occurs. Sturdy, explosion-resistant case safely isolates mechanical and electrical impact of circuit breaking. Top-mounted release vent protects the operator.

FOLLOWS FAST MINING OPERATIONS. Almost as easily as plugging in a light in your home, you snap on your ground-clamp . . . put your equipment to work in a new place simply by hanging this handy unit on the line.

Save safely . . . with this fused power-tap from O-B. See your local O-B representative for further information and prices or write us now. OHIO BRASS COMPANY, MANSFIELD, OHIO. Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass

HOLAN

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

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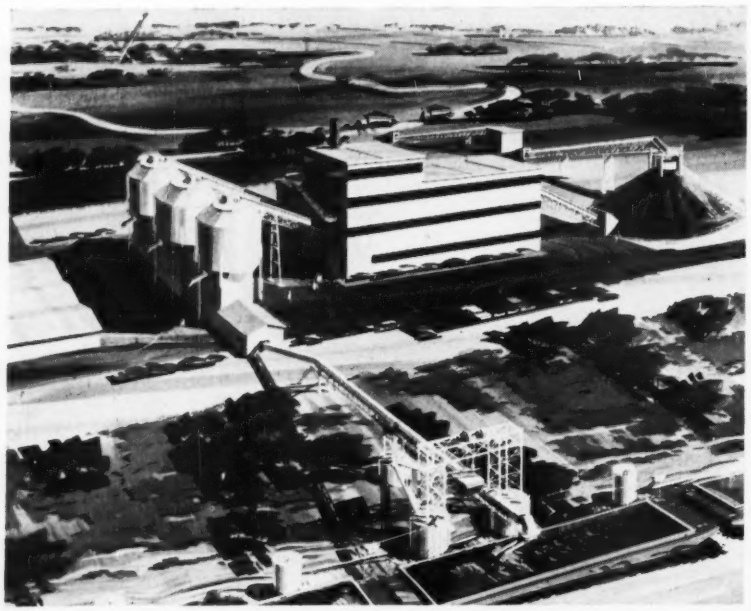

United Electric Completes New Mine

A spanking new direct barge-loading coal mine, built by The United Electric Coal Cos., is complete and ready to produce premium-grade coal from the newly-developed No. 2 seam, in Peoria County, Ill.

The new Banner mine, a few miles southwest of Peoria, is believed to be the first coal mine built on the bank of a navigable river, with a conveyor only 600 ft long to carry coal directly from preparation plant to river barge.

From stripping shovel to barge-loading dock, the new mine is all modern, using the most advanced techniques for efficient large-volume mining and preparation of coal, says the firm.

Run-of-mine coal from the pit is delivered to the truck dump, moved by conveyor to a crusher, and then on to a 2,500 ton storage pile. Coarse coal is washed in a Dutch State Mines heavy media vessel and can be crushed and rescreened to special domestic, commercial and industrial stoker sizes. Fine coal is cleaned by the Super-Airflow process.

Washed and sized coal, dust-proofed if desired, is conveyed from the preparation plant to three storage bins, two of 1,500-ton capacity, one of 1,000-ton capacity. The coal is carried by conveyor through a carefully calibrated automatic weighing device, directly to the dock.

A new 45-yd Bucyrus-Erie shovel is used in the pit for stripping operations. Production capacity is 4,000 tpd. Coals from Banner mine and from the company's Cuba, Buckheart, Fidelity and Ruby mines are shipped in barge tows to destinations on the Illinois and Mississippi Rivers and to Chicago for transshipment to lake vessels, for delivery to utility and industrial users at Great Lakes ports.

NCA (*Continued*)

holds both an MA and Ph.D. in marketing from Ohio State University and is the co-author of "Retailing—Principles and Procedures."

Harry Ballman was named director of the Air Pollution Control Div., a key sector of the association, in view of the rising concern over air pollution throughout the nation. Mr. Ballman, who was executive secretary of the Air Pollution Control Association and a fellow of the Mellon Institute of Industrial Research, will work with government agencies, civic organizations and coal groups to obtain cleaner air from processes using coal.

Sherman E. Burt heads a new Dept. of Membership Relations. He holds a law degree and was counsel for the American Coal Sales Association. Mr. Burt also serves as chairman of the coal committee for the American Bar Association's section on mineral and natural resources law. Expanding its horizons, NCA has just sent Harry F. Weisehahn, formerly of BCI, to Nashville, Tenn., where he will open a new district office. Many more personnel changes have been made, and still more are sure to come as NCA rounds out its growing team.

Fresh Outlook—Other physical transformations, seemingly small, are nevertheless significant in appraising NCA's fresh new outlook. A move to a new building in downtown Washington was made early in April. Called the Coal Building, the modern structure will afford NCA the room and light it needs for increased efficiency.

In communications, NCA has given a smart new format to its weekly publication. The bulletin, called "Coal News," is now breezy in black and orange trim and presents its contents on the first page so that readers can spot what they are looking for without lost time.

NCA explained that "the new, two-tone publication is the successor to the NCA Industry Bulletin. In keeping with the reorganization of NCA and our move to the new Coal Building, it was decided to give the association's weekly newsletter a more descriptive name and more attractive format. Other improvements such as more liberal use of pictures have already been instituted, and more will follow. The Public Relations Dept. will welcome suggestions."

The Future—NCA will, of course, continue to fight against inequities in fuel competition. It has recently voiced new appeals against excessive crude oil imports, gas importation from Canada and foreign tariffs on U. S. coal. But, note onlookers, it is what NCA has begun to fight for, and the new modern techniques it is bringing into play, which promise a brighter future for coal.

Active promotion of a national fuels policy which would eliminate unfair competition and designate more fruitful uses for coal, oil and gas is a central policy. And late in May, it appeared that an NCA-backed coal research bill was nearing successful passage through congress. What does it all mean to coal collectively, and to industrial coal producers? Says Stephen Dunn, "it indicates a strong determination to expedite discovery of the maximum potential of our Number One resource."

TVA May Buy Coal Tract

Tennessee Valley Authority filed in May an option to purchase some 60,000 acres of coal land in Bell, Harlan, Clay and Leslie counties, in southeastern Kentucky.

TVA's general manager, Aubrey J. Wagner, said the option was taken as part of the agency's effort to assure an adequate supply of coal for existing and proposed steam-electric generating plants in the eastern part of the TVA system.

For loading in seams 40″ and up ...coal, potash, gypsum, salt

22689

Goodman 967 loader

Capacity—30″ wide, 8″ deep conveyor with a rugged 2¼″ pitch chain provides plenty of room and moving speed for the lump or fine material loaded by the fast working gathering arms.

Maneuverability—gear driven, clutch controlled tramming eliminates need of reversing tram motors electrically—permits fast loading movements at the face.

There are other reasons too, for the success of the 967; in fact, for all of the Goodman 960 series loaders:

- simple contactor control because of one-direction, continuously operated tram motors—electrical maintenance is extremely low.
- four interchangeable motors for all machine functions.
- motors and contactor case up out of bottom muck and water.
- rugged, heavy construction with solid footing for stability in heaviest kind of loading and strong crowding effect.

Your Goodman sales engineer will be happy to give you the full story on the 967 or any other loader in the Goodman line.

22623

Basic height—34″ or 38″ Conveyor—30″ wide

Rated capacity—15 to 20 tpm

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If the option is exercised, after investigation to determine the extent and character of the coal reserves, it will be an unprecedented step for TVA. In no previous instance has it acquired land for the express purpose of providing a coal source of its own.

The announcement strengthened the belief that a new steam plant, with initial capacity of 500,000 kw, will be built on property which TVA has under option, about 5 mi southeast of Barbourville, Ky. Barbourville is in Knox County, Ky., adjacent to Clay, Leslie, and Bell counties.

The agency is apparently trying to carry out a policy of putting new power plants in or close to the coal fields. In western Kentucky, its Paradise plant, now under construction, is so located. This site, which contains large amounts of coal, was obtained by condemnation and the suit is still pending in the U. S. District Court, at Owensboro, Ky., according to reports.

If the new option is exercised, said Mr. Wagner, "it is contemplated that the coal reserves thus acquired will be offered competitively for development by private mining companies. The arrangements for mining will be made as needed to help provide an adequate economical coal supply. . . . "

WILLIAM A. RALEIGH JR. won a Jesse H. Neal Merit Award "for outstanding journalism" April 21, 1960, at the Hotel Biltmore, N. Y. C. The award, sponsored by the Associated Business Publications, was presented to Mr. Raleigh for his article, "Electric Heat Comes of Age . . . New Growth Patterns for Coal," published in the January, 1959, issue of *Coal Age*, a McGraw-Hill publication. Mr. Raleigh is a repeat winner, having won a first prize award for outstanding journalism in the 1956 Jesse H. Neal editorial achievement competition.

Steel Expands

An estimated $5 billion will be spent this year for iron and steel industry expansion and modernization throughout the world. About $1.6 billion, or almost one-third of the world outlay, is scheduled to be spent by United States firms.

Russia, second largest steelmaking nation, which produced about 20% of the world's steel last year, probably will spend at least $1 billion for iron and steel facilities this year. Approximately $1.1 billion will be spent by the European Coal and Steel Community countries, including Belgium-Luxembourg, France, West Germany, Italy and the Netherlands, and England and Japan. Nearly one-half the $1.1 billion will be spent in Japan.

Large expenditures will be made in the communist satellite countries, South America, India, Canada and Mexico. In total, these outlays will exceed $750 million. Sizable outlays are also scheduled for Portugal, Spain, Turkey, Pakistan, Iran, North Vietnam and many other countries. In India, where iron and steel industry growth has been rapid, a third 5-yr expansion plan is being prepared.

According to a report by the Economic Commission for Europe, Africa's steelmaking capacity will increase by more than 80% in the next 5 yr. The capacity in the Middle East will go up about 260% and the potential in the Far East will increase about 140%. Other increases over the next 5 yr include: Oceania, 56%; Latin America, 139%; Russia, 50%; Europe, 26%; and North America, 23%.

Sees Research As Vital

Coal research can be "the springboard of prodigious developments," Stephen F. Dunn, president, National Coal Association, recently told the 25th anniversary convention of the American Retail Coal Association.

Without the progress in mine productivity already made possible through applied research and engineering, it would have been impossible for the industry to keep the price of coal at today's level, Mr. Dunn said. He pointed out that, despite sharp wage increases and soaring costs of equipment and supplies, coal is currently sold at the mine within a few cents of the 1948 price. "Maintaining this stability in defiance of compelling inflationary forces is an unparalleled achievement in the annals of American business," he said.

The coal association executive said that all segments of the industry can benefit from NCA's research center and from enactment of the coal research bill now before the Senate. Meanwhile, he said, the industry should intensify efforts at making customers of industrial plants, schools, hospitals, and other institutions.

Mr. Dunn said government policies unfair to coal are "primary impediments" to the industry's progress. He called for prohibition of natural gas sales at dump prices and for a restriction on excessive residual oil imports.

Power Complex

Test runs are producing electricity for the first time at the new steam generating plant of Southern Electric Generating Co., at Wilsonville, Ala. The first of four 250,000-kw generating units is now complete and considered ready for operation following the test runs.

The plant, to be completed in 1962, will have a total capacity of 1 million kw and will be one of the largest steam generating plants in the world.

This concern, owned jointly by the Georgia Power Co. and the Alabama Power Co., is also developing two large coal mines, one in the Warrior coal fields and one in the Cahaba field, both in Alabama, to provide fuel for the plant.

Grading of the steam-plant site was begun in May, 1957, and work on the plant itself in April of the following year. The first and second generating units are now nearly completed. The first unit is undergoing shakedown tests and is expected to be ready for service the latter part of April. The second unit is scheduled for completion in July of this year.

The foundation for Unit No 3, scheduled to go into operation in April, 1961, has been completed and erection of steel for the boiler house has begun. Work on the foundation for the Unit No 4, scheduled for operation a year later, is well under way.

Coal handling and storage facilities, railroad spur tracks and ash disposal pond, are all substantially complete. Construction of two 230,000-V transmission lines built by Southern Electric Generating to connect the plant with the Georgia Power Co. system at two points on the Alabama-Georgia state line are complete. Alabama Power is providing its own 230,000-V transmission lines to connect the plant with its system.

Construction of Mine No 1, near Parrish, Ala., which began in April, 1959, is proceeding on schedule. A slope, 1,500 ft long, has been driven through solid

(*Continued on p 55*)

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MSA illumination products include miners' Edison electric cap lamps, permissible trip lamps and fluorescent mine lighting systems. Automatic lamp charging equipment is supplied for self-service lamphouse installations.

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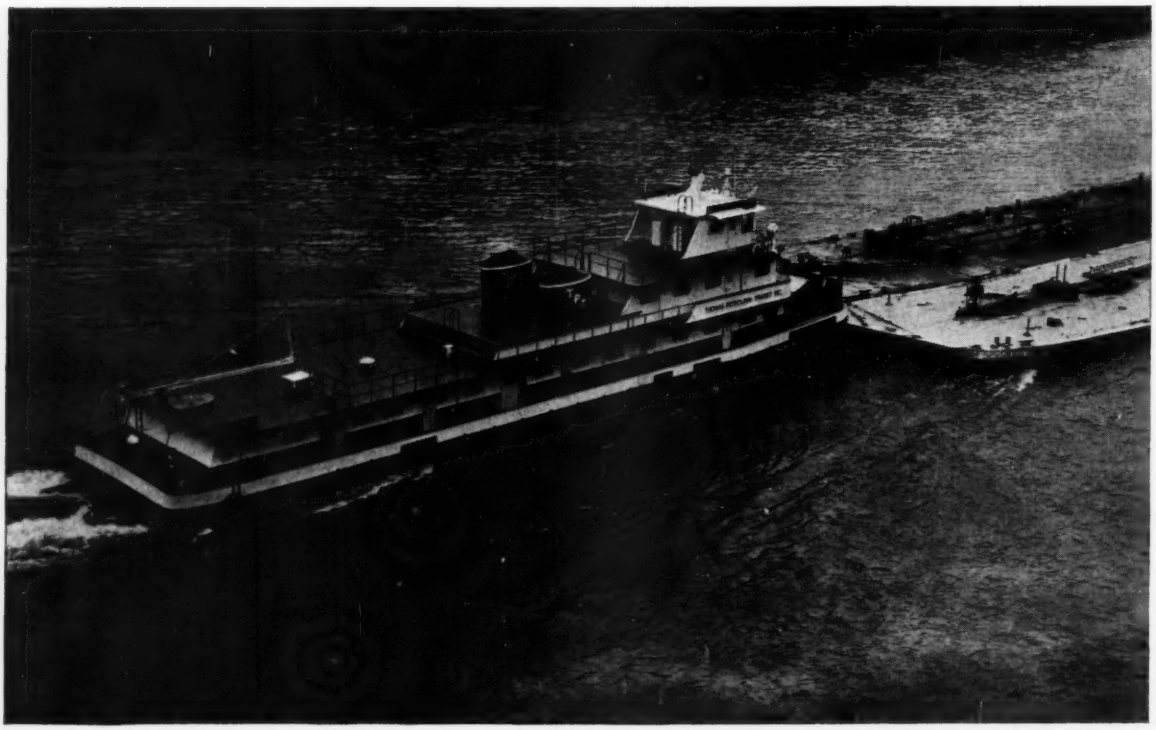
6th

Dravo 3200 towboat enters service... two more available for early delivery

The FRANKLIN PIERCE, newest Dravo-built 3200-horsepower towboat, has joined the fleet of Thomas Petroleum Transit, Inc., of Butler, Pa. It will be used to push 16,000-ton tows of gasoline, fuel oils, and solvents between Gulf ports and the Pittsburgh area.

Like all Dravo 3200's, the FRANKLIN PIERCE offers operating advantages made possible only by Dravo's *Precision-Balanced Propulsion.* In this system, all basic propulsion elements are designed and tested as a unit to give lowest ton-mile cost, resulting from greater pushpower and better maneuverability. We'll be glad to supply facts and figures on how a Dravo 3200 can increase your towing efficiency and profits. Write or call Marine Department, Dravo Corporation, Pittsburgh 25, Pennsylvania; SPalding 1-1200.



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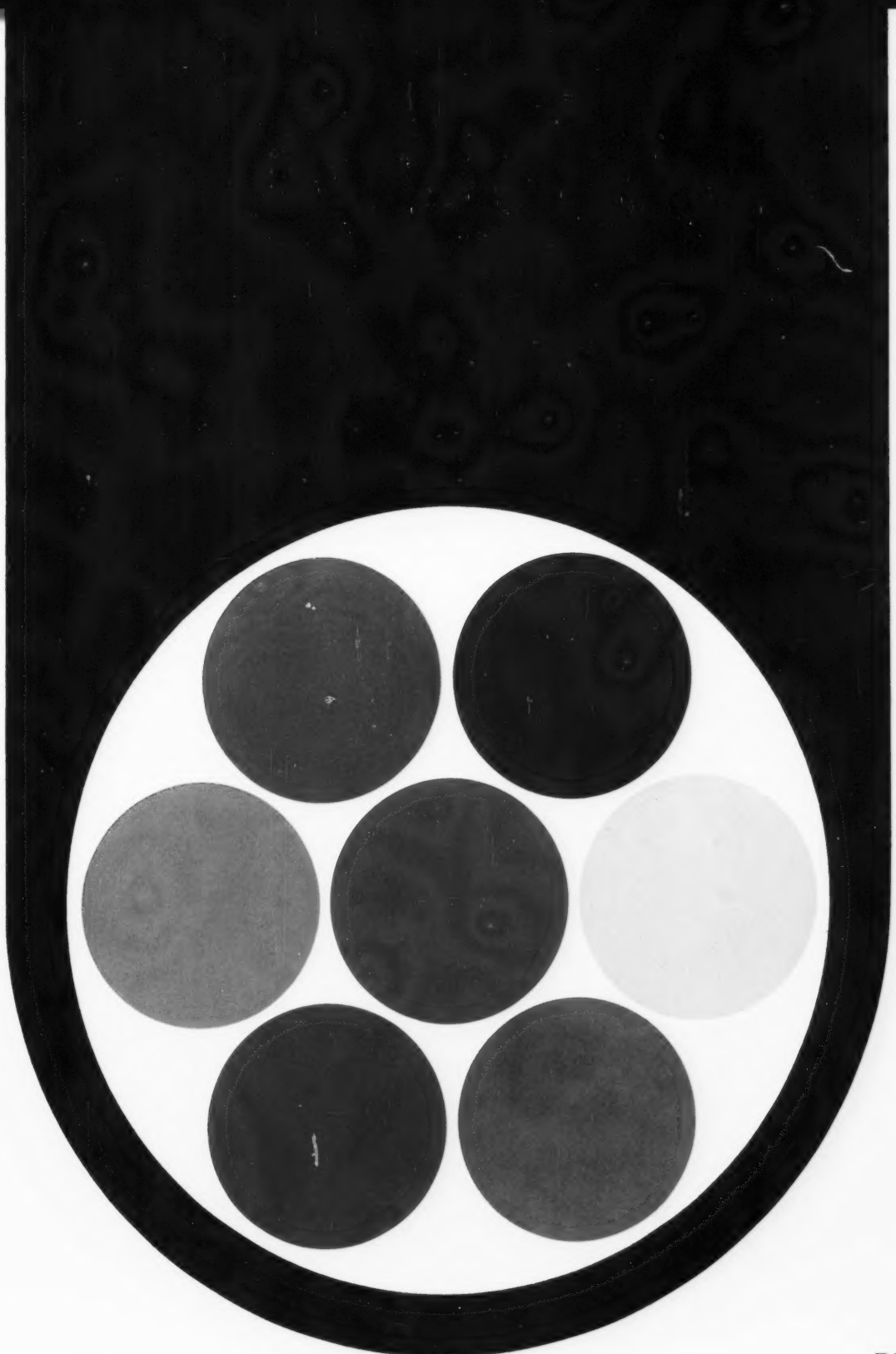

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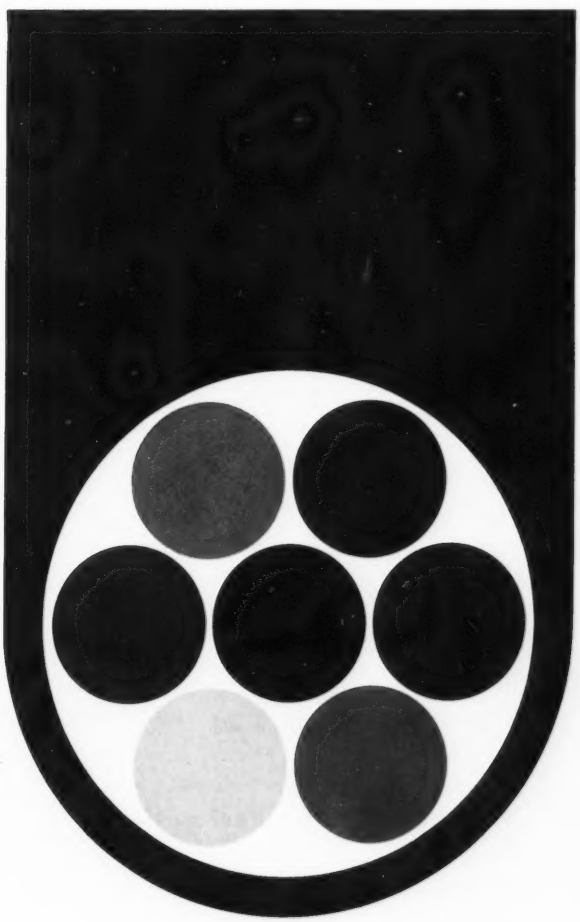

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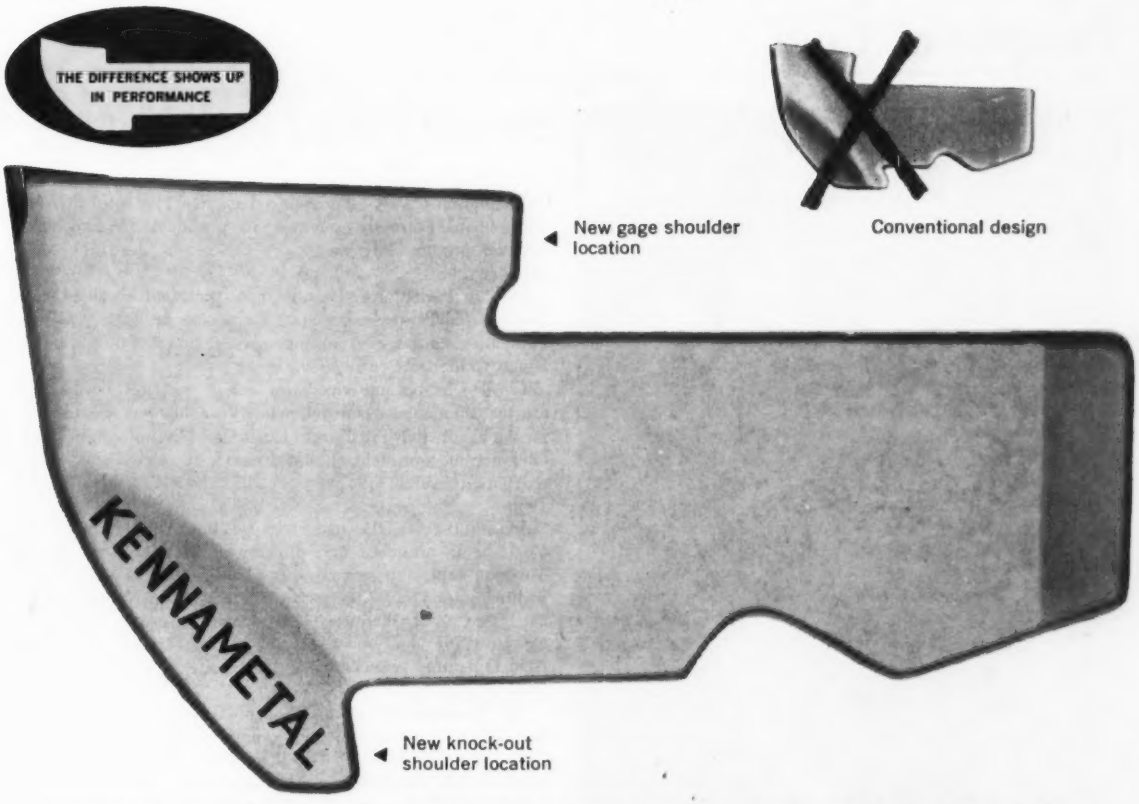

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- New positioning of the gage shoulder gives greater tool rigidity. The rubber keeper is subjected to much less flexing than in other designs . . . keepers last longer.
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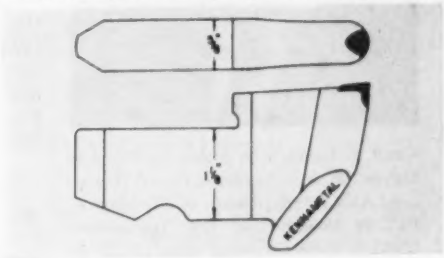
The new U17 Series Cutter Bit is available in all three standard tip styles. Ordering designations are: U17—Full Nose Radius (open face) Carbide Tip . . . U17R—Recessed Tip . . . U17RA—Cylindrical Plug (illustrated above).

Let the Kennametal difference show up in performance. Test this new Kennametal design in your mine. Call your Kennametal Representative or contact us direct. KENNAMETAL INC., Mining Tool Division, Bedford, Penna.



INDUSTRY AND KENNAMETAL ...Partners in Progress

People in Coal

Elected Consol President

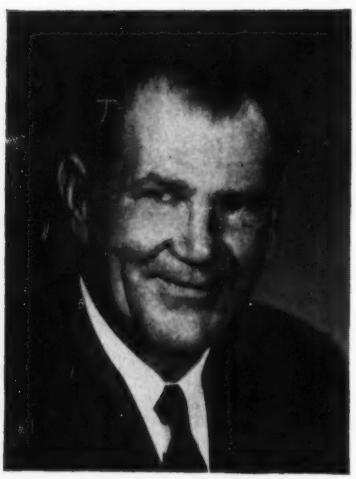
G. ALBERT SHOEMAKER has been elected president of Consolidation Coal Co., announced George H. Love, chairman of the board. Formerly executive vice president, Mr. Shoemaker fills the position left vacant by the recent death of A. B. Matthews.

Born in Parkesburg, Pa., the new president obtained a BS degree from Pennsylvania State University in 1923. Following graduation, he pursued an engineering career until joining the Union Collieries Co. in 1930.

In 1945 he became vice president of one of Consol's predecessor companies. The following year he was elected vice president of the Pittsburgh Coal Co. Div. of Consol, and later became president of that division. He was elected executive vice president of Consol in 1952, becoming a director in 1956.

In addition to the executive position with Consolidation Coal, he is president and director of Mathies Coal Co., an associate firm, a position he has held since 1952. He is also a director of Dravo Corp., Harmar Coal Co., National Potash Co., Pitt-Consol Chemical Co. and North-Western Hanna Fuel Co. He is president and a director of the Western Pennsylvania Coal Operators Association and a trustee of the Pennsylvania State University.

Mr. Shoemaker is a member of the American Mining & Metallurgical Engineers, and a past president of: Pittsburgh Coal Mining Institute; The Engineers Society of Western Pennsylvania; and the Coal Mining Institute of America. He is married to the former Jean Margaret Ogilvie, of Bayonne, N. J.



Virgil A. Curry, who makes his home in Dehue, W. Va., has been named to succeed Alex (Sandy) Grant, of Washington, Pa., as manager of The Youngstown Sheet & Tube Co.'s coal mines, in Pennsylvania and West Virginia, the company announced. Mr. Grant plans to retire.

Mr. Curry will establish headquarters in Huntington, W. Va. He will be in charge of operations at the Buckeye Coal Co., Nemacolin, Pa.; Youngstown Mines Corp., Dehue mine, Dehue, W. Va.; and Olga Coal Co., Coalwood and Caretta, W. Va.

A native of Barnabus, W. Va., Mr. Curry joined the Youngstown Mines Corp. as chief electrician in 1927 and has been mine superintendent since April, 1941.

He attended public schools in Logan, W. Va., continuing his education later at the West Virginia University Extension School of Mines. Active in Boy Scout work, he has received the Silver Beaver award and is vice president of the Chief Cornstalk Div. He is a member of the Logan chamber of commerce also.

Along with William Campbell, now superintendent of Youngstown's merchant mill at the Campbell, Ohio, works, Mr. Curry developed the Visual-Tension Indicator mine roof bolt.

Alex (Sandy) Grant is retiring as manager of the Youngstown Sheet & Tube Co.'s coal mines, in Pennsylvania and West Virginia. He has spent a lifetime career in the coal mining industry and 15 yr with Youngstown. Mr. Grant began his mining experience in his native Scotland and came to the United States in 1931. Before joining Youngstown in 1945 as general superintendent of Buckeye Coal Co., he was vice president of Coal Mining Management, in Denver, Colo. Previously, he held supervisory positions with Valley Camp Coal Co., Koppers Coal Co. and Wheeling Steel Corp. He is a member of AMC, AIMME and manager-director of the Coal Mining Institute of America.

Dennis L. McElroy has been named to succeed G. Albert Shoemaker as executive vice president of Consolidation Coal Co. Mr. McElroy has been a vice president of the company since 1947, first in charge of engineering, and in recent years as vice president of operations. He is a graduate of the West Virginia University School of Mining Engineering, where he also served as professor of mining engineering, as director of the School of Mines, and as director of the Industrial Extension.

Whitney Warner Jr. has been elected president of The Sterling Coal Co., Philadelphia. The firm has been in business since 1889, producing about 400,000 tons a year of high-grade steam coal in central Pennsylvania. Mr. Warner had been president of the Warner Collieries, Inc., a coal firm founded by his father and operating in Ohio and West Virginia. Warner Collieries recently merged with North American Coal Corp.

Announcing 3 NEW CARMET Mine-Tested Cutter Bits

Here's a trio of precision-made cutter bits, proven in operation to give long service under tough mining conditions. Your Carmet distributor carries them, and cutter bits for every mining operation, in stock. Check with him now.

Carmet JC Style Colmol and Boring Bit

Note the collar support that prevents bit block from splitting. Shank is forged from high-alloy heat-treated steel. Tough, hard, wear-resistant carbide tip is double-bonded by mechanical cap. Long operating life under all conditions.

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Another new outstanding Carmet bit for use on all cutting machines and continuous miners. Tip is embossed in high alloy heat-treated steel.

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Designed with husky bull-neck for use on Joy GV-6111 cutter chain. Style GVR has drilled carbide insert brazed into shank for maximum support. GV series available with double-bonded insert brazed to milled shank.

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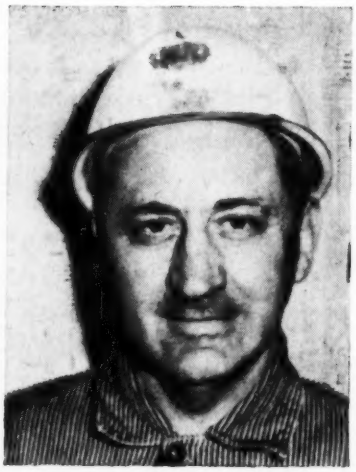
Changes At Freeman

Foster

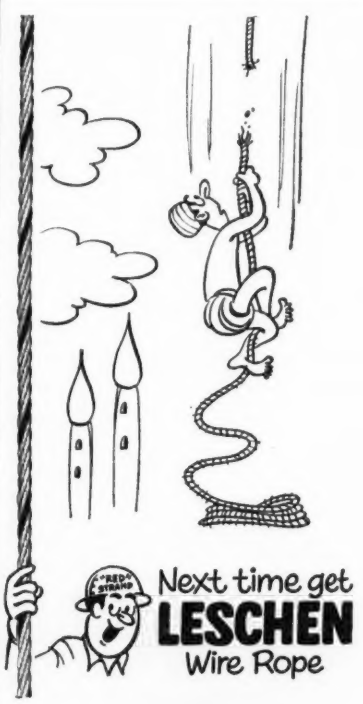
Castrale

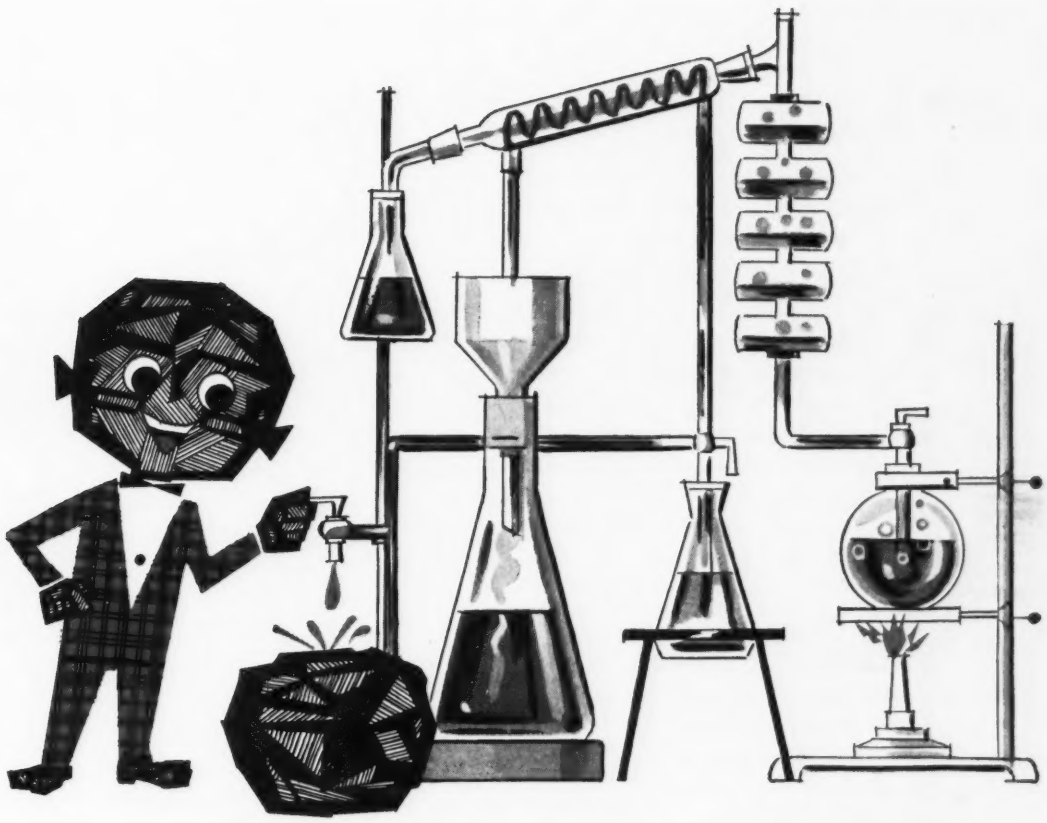
John R. Foster, superintendent, Orient No. 2 mine, for Freeman Coal Mining Corp., Chicago, has retired. He is replaced by **Arlie Cook,** formerly mine manager for Orient No. 2. Freeman also named **Aruino Castrale** superintendent of Orient No. 5, which is expected to go into production shortly. Mr. Foster was born at Flemingsburg, Ky., and studied at the University of Kentucky. He worked as mine superintendent for Chicago, Wilmington & Franklin Coal Co., later incorporated into Freeman Coal Mining Corp. After serving in the Marine Corps in World War I, Mr. Foster joined Freeman in 1928 as superintendent for Orient No. 2. Mr. Cook is a native of Franklin County, Ill. Starting as a miner at Orient No. 2, he progressed steadily until he became mine manager in 1949. Mr. Castrale was born in Italy and came to the United States at an early age. He served in the Army during World War II, afterwards attending Missouri School of Mines and Metallurgy, graduating in 1950 with a BS in mining engineering. He joined Freeman in 1950, and has served in the Preparation Dept. as well as in underground mining.



Cook

Earl J. Evans, vice president and controller, Spring Canyon & Royal Coal Co., Salt Lake City, Utah, has been named president of the Utah-Wyoming Coal Operators Association. He succeeds **Glenn E. Sorensen,** president, Kemmerer Coal Co. and Gunn-Quealy Coal Co. Mr. Evans is a native of Murray, Utah, and started his career with Spring





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mining is minutes

ACF Mine Cars save minutes every trip. For example, ACF Drop Bottom Cars unload on the move at the rate of a ton a second. End Dump and Rotary Dump Cars save time, too, with such features as anti-friction, Load-Support Wheels which permit safe, high speed haulage, automatic couplers for safer, faster handling and double-action spring bumpers to lower maintenance.

American Car and Foundry offers you all types of mine cars in sizes from 2 to 30 tons, plus Load-Support Mine Car Wheels and other repair parts . . . all designed to save you from minutes to hours, from pennies to dollars on increased mine output.

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People in Coal *(Continued)*

Canyon & Royal 20 yr ago. The Utah-Wyoming Coal Operators Association also chose other officers: **H. J. Schultz,** manager, Western Coal Mining Co., Rains, Utah, was named vice president; **Grant A. Foulger,** Ogden, Utah, was elected a new member of the board; and **T. J. Canavan,** Boise, Ida., was renamed executive secretary and treasurer.

J. S. Chapman, who has been assistant to the manager, coal mines, for Armco Steel Corp., has been promoted to assistant chief safety engineer on a company-wide basis. He will handle his new job from company headquarters in Middletown, W. Va. Mr. Chapman attended the West Virginia Business College and Morris Harvey College. He joined Armco in 1937 as tipple foreman at the Nellis operation, advancing to analyst in 1939 and to the Coal Sales Dept. in Charleston, W. Va., in 1943. In 1946, he transferred to the Montcoal operation as supervisor of personal relations. Mr. Chapman has served in many civic groups and is a member of various organizations, including the Coal River Mining Institute, the West Virginia Coal Mining Institute and the American Mining Congress. He currently is president of the Coal River Lake Association, and is vice president of the Appalachian Council, Boy Scouts of America.

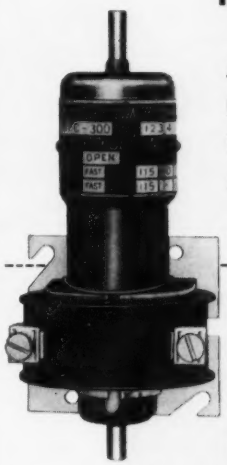
Newton H. DeBardeleben, president, DeBardeleben Coal Corp., Birmingham, Ala., has been appointed chairman of the National Coal Association's 1960 annual meeting committee. A director of the NCA, Mr. DeBardeleben is a graduate of the University of North Carolina, and Yale University, where he received a law degree in 1939.

Thomas J. Lamont, 51, mines superintendent, Sterling Coal Co., died May 8. With Sterling about 22 yr, he had been fire boss, mine foreman and safety director before being named superintendent.

silent.. sure... Mercury works better

for you in Durakool Contactors

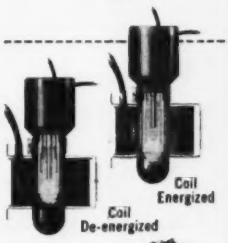
Timer Relays-Switches



All-Steel bodies with welded seals are rugged. Hypressure Hydrogen Gas, permanently sealed inside, quenches arc, dissipates heat, insures low contact resistance. They just keep working.

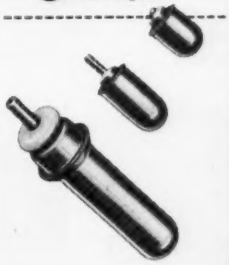
CONTACTORS

Designed to handle heavy inrush currents. Silence is wonderful for studios and theaters. Enclosed contacts safest for explosive atmospheres. Up to 100 ampere continuous capacities. 1, 2 and 3 pole combinations.



TIMER RELAYS

Durakool engineered metering system designed to be tamper-proof and dependable. Single moving part assures trouble-free operation. 1, 2 and 3 pole combinations.



SWITCHES

Work in any position around diameter. 1 ampere sizes are mercury to metal design, over 1 ampere are mercury to mercury. Available uninsulated or insulated in any of a variety of materials.

Write for Bulletin No. D-73 or see Sweet's Electrical Catalog— Section 5b

Durakool®
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Chicago, Illinois, Durakool, Inc., Rm. 528, 333 N. Michigan Ave.
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Hatboro, Pennsylvania, Raymond H. Barnes, 422 Tanner Rd.
Los Angeles 28, Calif., R. Meussdorffer & Asso., Suite 1, 3491 Cahuenga Blvd.
Montreal, Que., Canada, Measurement Engineering Ltd., P. O. Box 1352, Sta. O.
Newtonville, N. Y., Walter F. Haines, Apple Tree Lane
New York 70, N. Y., Durakool of New York, 4747 Bronx Blvd.
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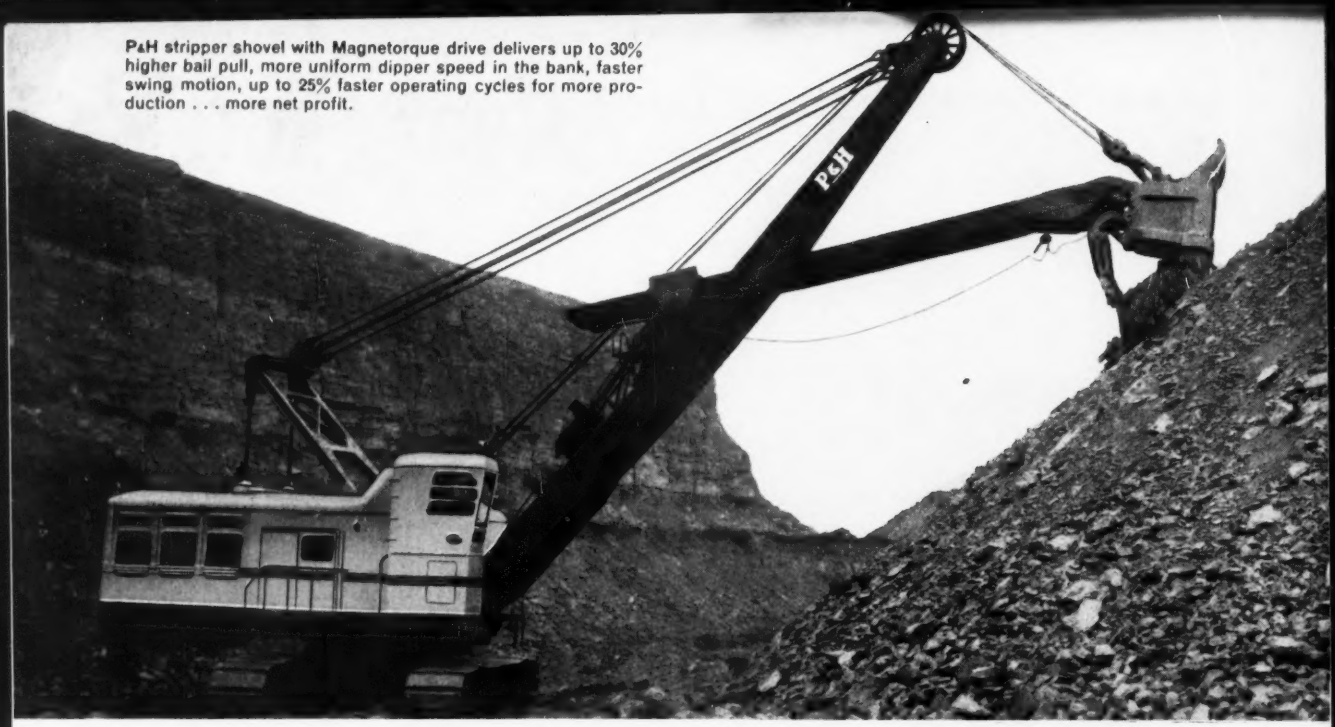
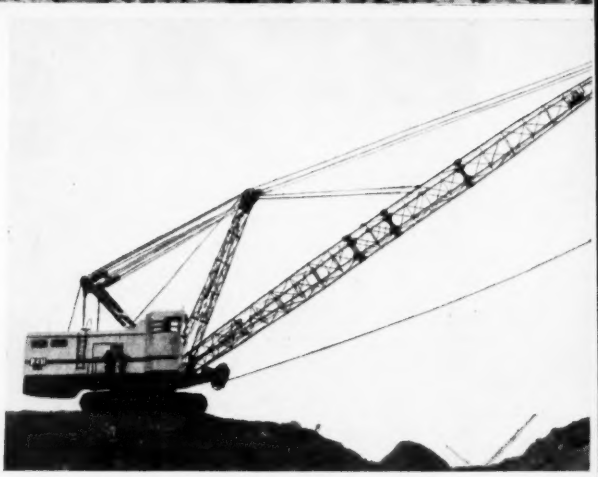
P&H stripper shovel with Magnetorque drive delivers up to 30% higher bail pull, more uniform dipper speed in the bank, faster swing motion, up to 25% faster operating cycles for more production . . . more net profit.



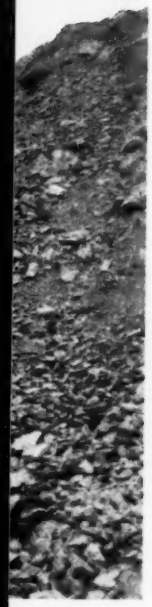
3½-yard P&H diesel excavator features long crawlers and Magnetorque drive for swing and propel motions. Equipped with 48-ft. boom and a 34-ft. dipper handle for economical stripping operation.



P&H 1855 is fully convertible for long range dragline service. It is the largest excavator mounted on a single pair of crawlers—unmatched for maneuverability.

1½-yard P&H excavator loads coal into trucks. Exclusive P&H Magnetorque drive for swing and propel motions delivers the smoothest, fastest, most accurate swings and "move ups" known in the industry.

Versatile P&H truck crane for handling material at mine siding and a variety of utility jobs. Highly mobile unit features quick, easy change-over of front end attachments—from crane, hoe, dragline, shovel, clamshell.



It pays to standardize on P&H...

P&H WITH MAGNETORQUE® DRIVE GETS DOWN TO COAL FASTER... LOADS IT OUT QUICKER

It's good business to standardize on P&H electric shovels and draglines, diesel excavators and truck cranes for all your needs . . . big, medium or small . . . There's a size and type for every job.

Full-Electric and Diesel-Electric Shovels and Draglines from 3½ to 10 yards—Big, rugged electrics that deliver up to 10% more production with exclusive MAGNETORQUE drive—the most productive work-motion drive known for mining excavators. The system that electro-magnetically transmits driving energy of the power plant (A.C. electric motor or diesel engine) direct to the work motions, without intermediate conversion to D.C. current.

Diesel Excavators from ½ to 4 yards—Workhorse machines that pay for themselves fast with increased production . . . higher job availability. Among the various models you find important bonus features—such as: Magnetorque—powered swing that delivers the fastest, smoothest swing motion in the industry . . . Sealed Power Box design with all gears running in an oil bath, completely sealed from dust and dirt for trouble-free, maintenance-free operation . . . Quick, on-the-job convertibility from shovel to dragline service.

Versatile Truck Cranes from 12½ to 80 tons—Highly maneuverable, powerful truck cranes that keep your big crawler excavators free for production . . . Mobile units ideally suited for handling secondary road-building, refuse disposal, drainage, erection, maintenance and 101 utility jobs. . . . Truck cranes that can be changed in the field to any front-end attachment quickly, easily and without special tools.

See for yourself why more mines today are standardizing on P&H equipment. There is a reason . . . Harnischfeger offers you more advanced designs, new concepts in engineering that pay off in increased production and lower operating costs.

Compare before you buy—write today for more information.

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P&H
CONSTRUCTION & MINING DIVISION

P&H Ad 60-521

Coal Abroad

No Oil From Coal

The Wankie Colliery Co., Ltd., which owns one of Africa's largest coalfields at Wankie, Southern Rhodesia, has announced that the establishment of an oil-from-coal industry in the Federation of Rhodesia and Nyasaland is at present not economically practicable. A report issued by Wankie after exhaustive investigations spread over more than 2½ yr concludes that the project would for some time be an unsound financial venture "which private enterprise alone cannot be expected to finance." Lubimbi coalfield, which is situated approximately 60 mi northeast of Wankie, contains large reserves of medium- to low-grade coal particularly suitable for gas synthesis. The investigators rejected the Lubimbi scheme, however, because it would have involved the establishment of a new coal mine and a costly construction program to provide housing, water and power supplies. The alternative scheme considered envisaged drawing supplies of coal from the Wankie Colliery itself and the siting of an oil-from-coal plant at either Livingstone or Bulawayo, where the necessary amenities are available. However, the report reveals that interest and capital redemption would be heavy, and that production costs would leave no margin for distribution costs and profit.

Following upon the Wankie Colliery Co.'s report, the Federal Minister of Commerce & Industry, Frank Owen, announced that the possibility of the federal government starting an oil-from-coal industry is to be investigated. Mr. Owen said that although the investigation conducted by the Wankie Colliery Co. had shown that such a project could not be operated economically by private enterprise alone, the ministry would look at additional factors, some of which were under government control.

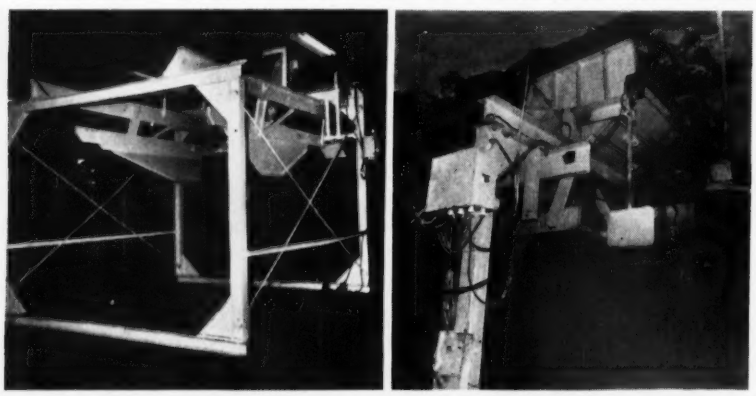
Among these would be the method of arriving at the capital charges for the project and the cost of the finance involved, the collection of motor spirit duties, railway rates and the price of coal itself. The government would also consider whether, by substantially increasing the proposed capacity of the oil-from-coal plant (the Wankie Colliery Co.'s investigation was based on a production rate of 21 million gallons of oil a year) and thereby lowering the unit cost of production, the project could be made a truly economic proposition.

Overseas Flashes

RUSSIA—Researchers claim they have developed an anti-corrosion method that multiplies the life of steel pipe 7 to 10 times. The Ukrainian Scientific Research Pipe Institute notes it has discovered a so-called thermal diffusion method by which a section of pipe is packed in a mixture of zinc powder and fire clay, then put into a special furnace and heated to 430 C. The pipe, thus saturated with zinc, takes on anti-corrosion qualities, declares the institute.

CZECHOSLOVAKIA – This nation exported a total of 4,116,575 tons of coal to 16 countries last year, amounting to about 5% of the total Czech coal output. Exports of coal and coke to western Europe increased by 14% while soft coal exports to the same area rose 7%.

JAPAN—Japan's coal firms are finding the going so tough they have taken to selling oil. Furukawa Mining Co. has established a Furukawa Oil Trading Co. to sell oil products to be supplied monthly by Daikyo Oil Co., independent oil firm. Sumitomo Coal Mining Co. also is expected to make public a blueprint



From Conveyor Belt to Car Loading Points

Tremendous Savings Are Possible With the STAMLER Automatic TILT PAN

Big operational savings . . . low initial cost . . . and minor upkeep expense make the STAMLER Automatic Tilt Pan a real necessity for efficient mine operation!

It automatically loads entire trip without belt stoppage or spillage between cars. Shuts down automatically without spillage if the last empty car becomes loaded. Operates perfectly with non-uniform car lengths.

It permits use of boom man on productive face jobs . . . and gives uniform car loading without an attendant to "press the button."

Quickly installed and easily moved. No hydraulic power source required. The cars themselves operate the tilt pan at the exact proper moment.

STAMLER Automatic TILT PANS

Let us show you how the STAMLER Automatic Tilt Pan will save money in your mine. Write today for folder.

W. R. STAMLER CORPORATION
PARIS, KENTUCKY

SCHROEDER BROTHERS, Exclusive Eastern Sales Agent
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on oil sales, which it has been contemplating a long time. Mitsui Mining Co. set up the General Gas Co. and has applied for approval to the Japanese Trade Ministry to import gas from Saudi Arabia early next year.

GREAT BRITAIN – Diesel and electric power has now overtaken steam power in number of passenger miles on the U. K. nationalized rail service, say the British. The British Transport Commission predicts that by 1961 the number of steam locomotives will be about 40% less than at present. Impact of the British railways' dieselization and electrification program shows up clearly in fuel consumption figures, where diesel fuel oil over recent years has made impressive gains.

Equipment Approvals

The Jeffrey Mfg. Co.—Type ML-81C loading machine; five motors, four 15-hp and one 6 hp, 250 V, DC. Approval No. 2F-1547, April 5.

The Jeffrey Mfg. Co.—Type MM-86A Colmol with 94B conveyor; four motors, two 70 hp, one 50 hp and one 7½ hp, 440 V, AC. Approval No. 2F-1548A, April 13.

Long-Airdox Co.—Type 188 loading machine one motor, 80 hp, 220-/440-/550 V, AC. Approvals Nos. 2F-1549 and 2F-1549-A, April 14.

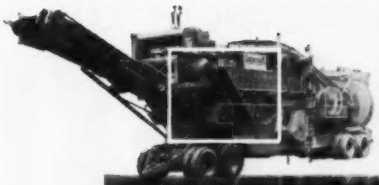
Goodman Mfg. Co.—Type 2430 universal cutting machine; two motors, one 50 hp and one 75 hp, 440 V, AC. Approval No. 2F-1550A, April 18.

The Valley Camp Coal Co.—Roof-drilling machine; rebuilt from Goodman Types 52T and 54 timbering machines; two motors, one 10 hp and one 1 hp 250 V, DC. Approval No. 2F-1551, April 19.

Goodman Mfg. Co.—Type 584-40 shuttle car; three motors, two 20 hp and one 10 hp, 440 V, AC. Approval No. 2F-1552A, April 20.

Goodman Mfg. Co.—Type 584-41 shuttle car; three motors, two 20 hp and one 10 hp, 440 V, AC. Approval No. 2F-1553A, April 20.

Joy Mfg. Co.—Type 6CM-1BF continuous mining machine; eight motors, two 100 hp, one 40 hp, three 10 hp and two 25 hp, 500 V, DC. Approval No. 2F-1504A, April 29.



Cedarapids Super Commander Portable Crushing and Screening Plant, built by Iowa Manufacturing Company, Cedar Rapids, Iowa, produces up to 500 tons of material per hour.

This high capacity V-Belt Drive handles 60% more power in 30% less space!

Gates Super HC V-Belts solve product-development problem!

Iowa Manufacturing Company was faced with a problem: Transmitting 400 hp from a higher-speed engine in a space that had been just enough for conventional V-belts carrying 250 hp.

At higher speeds, centrifugal force made larger sheave diameters impossible. A wider span of belts was ruled out by Highway Department restrictions of overall machine width to eight feet.

Iowa Manufacturing's designers solved their primary problem of transmitting 60% more horsepower with new Gates Super HC V-Belts.

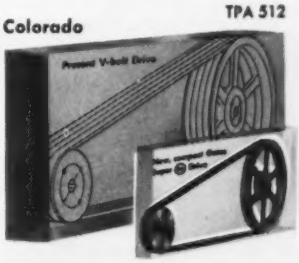
Because Super HC V-Belts have smaller cross section, use narrower and lighter weight sheaves, designers also succeeded in reducing drive weight, width and height—a decided bonus in portable equipment.

Nation-Wide Engineering Service

A Gates Distributor can show you how sheave diameters can be reduced 30% to 50%, drive space up to 50%, and drive weight 20% or even more with Super HC V-Belt Drives. Ask him for your free copy of *"The Modern Way to Design Multiple V-Belt Drives"*, or write to The Gates Rubber Company Sales Division, Inc., Denver, Colorado.

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

TPA 512



Gates
World's Largest Maker of V-Belts

Gates Super HC V-Belt Drives same hp capacity in smaller "package"

NOW — A CONVEYOR IDLER PROVIDING TRUE CATENARY SUSPENSION FOR THE BELT

the S-A FLEXIROLL®

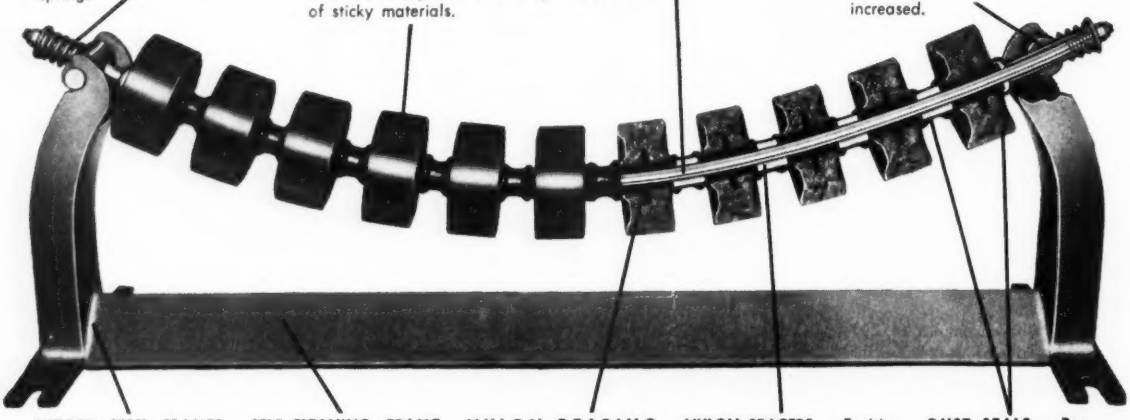
CATENARY CARRIERS FOR BELT CONVEYORS

EASY REPLACEMENT—Shaft, and entire idler assembly simply lifts out of ears in brackets, merely by depressing trunnion spring.

FLEXITEX MOULDED ROLLER — High resistance to abrasion, combustion and chemical corrosion. Cushions impact of material on belt, prevents build-up of sticky materials.

SPRING STEEL SHAFT 85/95 TONS TENSILE — Provides natural troughing with belt under all load conditions. Prolongs belt life.

STEEL TRUNNION & TRUNNION SPRING — Trunnion is offset to provide ease of adjustment for belt training — spring is shock absorbing to flex as load is increased.



WELDED STEEL FRAMES — All steel, deeply-ribbed end stands accurately jig-welded to the stiff angle cross-member.

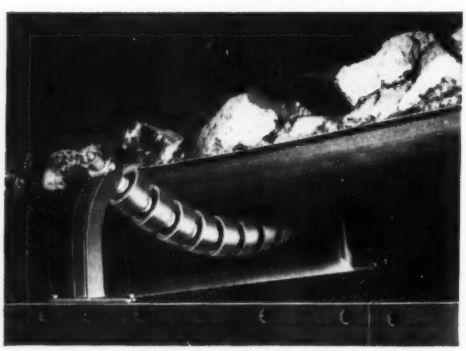
SELF-CLEANING FRAME — Inverted angle cross-member and self-cleaning end-brackets prevent material from collecting and fouling rollers.

NYLON BEARING GRAPHITE IMPREGNATED — Ensures long life without maintenance. No lubrication required.

NYLON SPACERS — Positive connection between rollers is achieved by mating jaws of nylon spacer and bearing of roller.

DUST SEALS — Protects bearings from ingress of foreign matter.

AVAILABLE FOR 18", 20", 24", 30" and 36" BELT WIDTHS



Closeup of a 30" S-A FLEXIROLL Catenary Idler in operation on belt conveyor handling coal. There is no fire risk with the FLEXIROLL and material breakage is reduced to a minimum.

- Resists corrosion, abrasion, grease, flame, oil, clogging and freezing.
- Increases belt training and greatly reduces belt wear.
- Both idler and stand self cleaning — eliminate material build-up.
- No metal to metal contact — flexing of idler prevents dust build-up, eliminating fire risk.
- Flexing action reduces material breakage, prevents spillage.
- One-third the weight of all-metal idlers — saves space, weight in supporting structures.
- Idlers can be easily and quickly replaced.
- Spring steel spindle provides greater strength than steel cable used in many Catenary-Type idlers.
- All-steel flanged and jig welded frames.
- Catenary suspension of the FLEXIROLL carrier supports the belt in a natural arc.

WRITE FOR BULLETIN 260

S-A
ENGINEERED BULK HANDLING SYSTEMS
MATERIALS HANDLING PRODUCTS
SPEEDWALK PASSENGER CONVEYORS
SEALMASTER BALL BEARING UNITS
SPHERCO BEARINGS & ROD ENDS

STANDARD PRODUCTS DIVISION
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GENERAL OFFICE & MAIN PLANT, 55 RIDGEWAY AVENUE, AURORA, ILLINOIS

PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA • CLARKSDALE, MISSISSIPPI
BELLEVILLE, ONTARIO

Let the master mechanic loaf. When you find him busy, it means expensive overhauls and down time. Instead, put the Amoco Mine Lubrication engineer to work. His services cost nothing and his recommendations save money. Thoroughly trained, he knows all kinds of deep and strip coal mining equipment by make and model – just which lubricants

He's relaxed... that's good!

from Amoco's complete line do the best job... give longest service... cut operating costs the most. Have him come in. Contact your nearest Amoco office, or the American Oil Co., 555 Fifth Avenue, N.Y.17, N.Y.

AMOCO
LUBRICANTS
for mine machinery

AMOCO

Current Coal Patents

By: **Oliver S. North**

Process of separating mixtures of particles, P. Marot (assigned to Stami-carbon N.V., Heerlen, Netherlands), April 12, 1960. Process for separating mixtures of particles, e. g. non-deslimed coal, differing in size and specific gravity wherein the initial wet-screening treatment is carried out with the use of a separating suspension capable of subsequent use in the separation of the resulting fine fraction so as to eliminate the necessity of screening the latter. No. 2,932,395.

Disintegrating head for continuous miner, A. L. Barrett (assigned to Joy Mfg. Co.), April 12, 1960. An improved rotary-drum-type disintegrating head for a continuous miner has paddles attached for moving the broken mineral rearwardly away from the working face during the mining operation. No. 2,932,496.

Loading machines, W. Whaley, April 19, 1960. In a coal loading machine, the driving and traction control is simplified and improved. Complex operation of a drive shaft, clutch mechanism, etc., is not required. The main frame of the loader is mounted on a carriage for bodily tilting movement around a transverse shaft. No. 2,933,142.

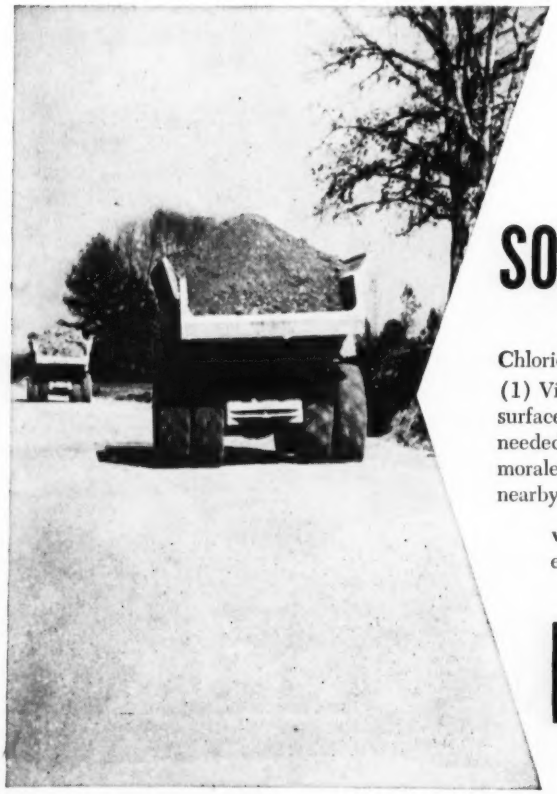
Belt handling apparatus, J. B. Long (assigned to The Long Co.), April 19, 1960. An improved handling apparatus is provided for the addition to or removal of lengths of belting from an extensible belt conveyor, whereby the reels of belting may be manipulated with ease. This apparatus is particularly useful in tight quarters because the belting can be applied from either one side of the conveyor or the other, as space permits. The apparatus is extremely compact and has a minimum of movable parts, thereby minimizing troubles caused by accumulations of abrasive dust and dirt. No. 2,933,177.

Coal minning machine of the laterally cutting type, J. A. Meehan Jr., April 19, 1960. Design for an improved and relatively low-cost coal mining machine having a lateral swinging cutting action. Power requirements are moderate. Cuttings are delivered at a slower rate so that coal removal may be accomplished with ordinary shuttle cars. This machine is particularly suitable for use in a small coal mine. U.S. Patent No. 2,933,294.

Cutter bit and chain block, L. G. Rollins (assigned to Joy Mfg. Co.), April 19, 1960. Improved chain block and cutter bit structure for use with a mining machine cutter chain. The shank type cutter bit has an enlarged portion to reduce breakage at points where normal breakage of a standard bit occurs. A standard shanked bit may be used in the block-socket. No. 2,933,295.

Machines for cutting rooms in mines, M. J. Davies (assigned to Coal Industry (Patents) Ltd., London, Eng.), May 3, 1960. Design for a machine for mining operations, such as cutting longwall faces, thick or thin seams, cutting and loading riggings in gate roads, and cutting recesses at the ends of longwall faces. No. 2,935,310.

Material treating apparatus, W. Hartmann (assigned to Hartmann Processing Co.), May 3, 1960. In a method for transforming agglomerated anthracite silt or other coal silt into friable pieces which will not adhere to belts, shakers, sides of railroad cars, etc., the silt is broken up, sprayed with spent sulphite, and the sprayed material thoroughly stirred so as to produce a mass of friable pieces which can be readily handled. U.S. 2,935,388.



For dust-free haulage roads–

SOLVAY CALCIUM CHLORIDE

It *pays* to end dust on haulage roads with SOLVAY® Calcium Chloride, for five good reasons.

(1) Visibility is improved . . . roads are safer. (2) Compacting the road surface makes it strong enough for heavy loads, yet little maintenance is needed. (3) Equipment keeps in better mechanical shape. (4) Worker morale is improved . . . no dust hazard. (5) No dust complaints from nearby residential areas either!

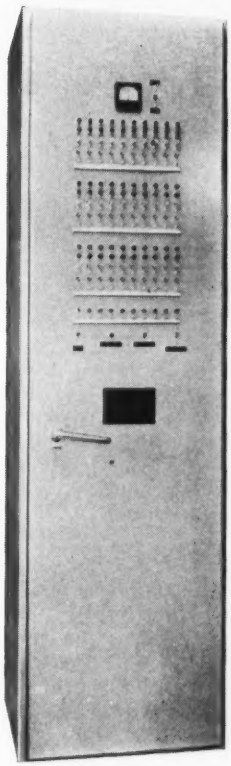
WRITE FOR "END DUST." Booklet tells how your men can easily and economically compact roads using SOLVAY Calcium Chloride.

Allied Chemical

SOLVAY PROCESS DIVISION
61 Broadway, New York 6, N. Y.

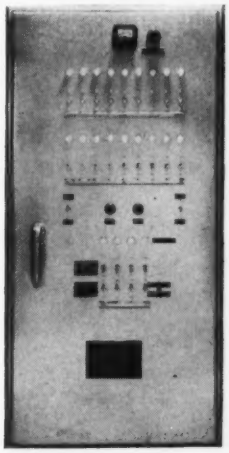
SOLVAY branch offices and dealers are located in major centers from coast to coast.

LARGE MINES



10 FANS
30 CIRCUIT BREAKERS

small mines



4 FANS
14 CIRCUIT BREAKERS

There's a FEMCO 709 system to meet your needs

Fan-actuated power shut-off plus centralized monitoring and remote control over a single pair of wires

No matter how many fans and circuit breakers . . . no matter what distances are involved . . . no matter where the power comes from, there is a 709 system which will provide these services:

1. Automatic shut-off of power going into the mine in the event of fan failure.
2. Centralized monitoring of all fans and circuit breakers.
3. Selective remote control of all circuit breakers and, if desired, of all fans.

The heart of this system is the Femco Circuit Scanner. Essentially, this is a synchronous commutator using hermetically sealed reed switches instead of sliding contacts. A rugged clock motor drives a rotating arm on which is mounted a permanent magnet. As the arm passes each switch, the magnet closes that switch. The circuit thus established is maintained long enough to permit transmission of an indication from the field station and, if desired, a control impulse from the central station.

Scanners are located at each field station and at the central control station. Special circuits keep all scanners in synchronism. Since the scanner motors operate continuously, no extra starting circuits are necessary, thus simplifying the system and keeping costs down.

We will be glad to send you further information, or to discuss the Femco 709 system as it applies to your specific situation. Just write or call FEMCO, INC., IRWIN, PA.

A-202

Femco **COMMUNICATIONS:** Carrier and wired audio systems for all mining and industrial applications. **MONITORING:** Fans, circuit breakers, valves, pumps, compressors, etc. **TELEMETERING:** Flows, pressures and other functions. **REMOTE CONTROL:** Pumps, valves, circuit breakers, soaking pit covers, furnace doors, cranes, or other moving equipment.

For *extra* tonnage, take these two Sun products underground . . . *just these two*

Sun 740-A EP, a *universal* mining machine lubricant, is the product miners have been asking for . . . an all-purpose lubricant that clings like grease, pours like oil . . . a product that eliminates *all* other products, except hydraulic fluids, for daily underground use.

Not only does Sun 740-A EP reduce underground oil inventories to two products (Sun 740-A EP and a hydraulic oil), but even more important, these two partners in production cut maintenance costs as much as 33%, and increase tonnage by keeping equipment at the face longer.

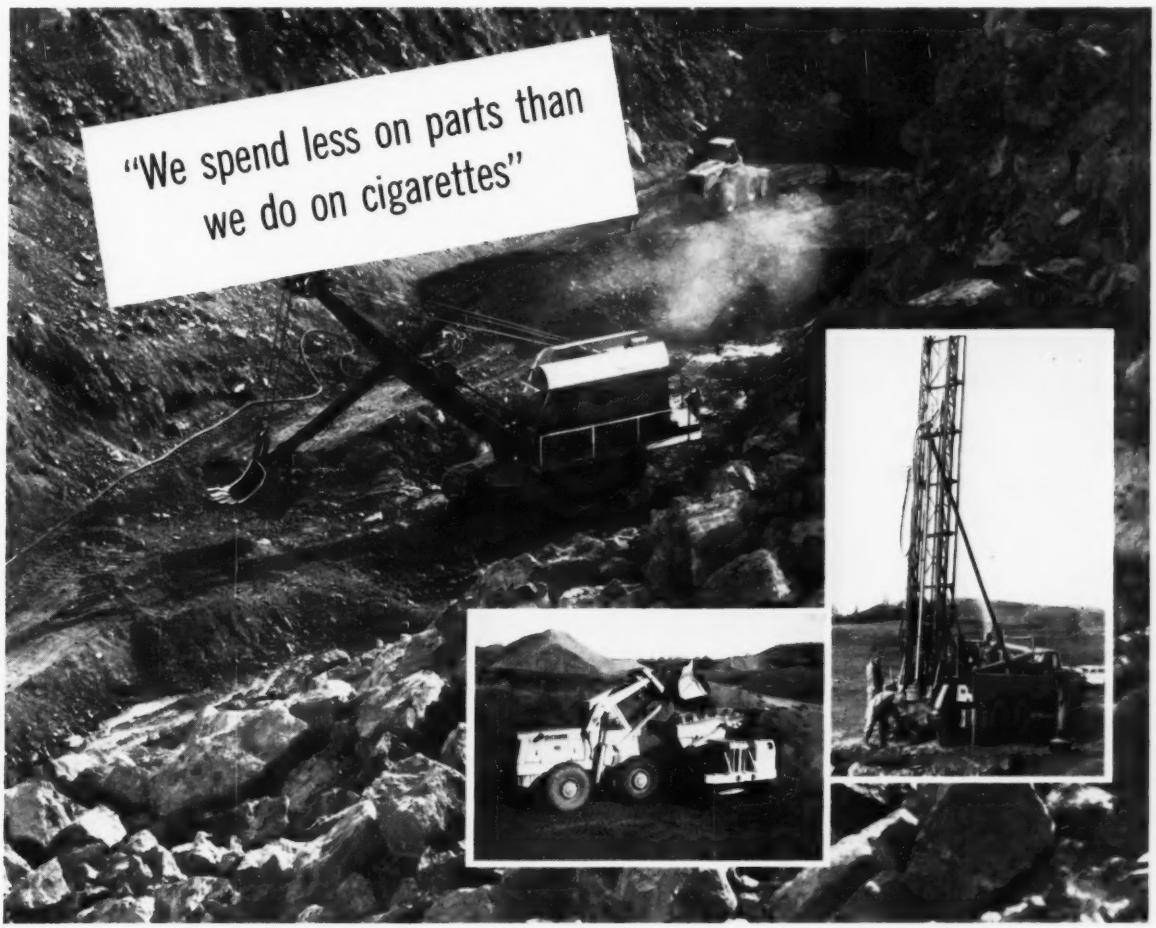
Your Sun man has a safety hat in his car. He knows mining equipment. He knows what's good for it. Get in touch with him, or write SUN OIL COMPANY, Phila. 3, Pa., Dept. CA-6. In Canada: Sun Oil Company Limited, Toronto and Montreal.

SUNOCO

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

Metallurgical Memo from General Electric

GET REAL PRODUCTIVITY—GET A GM DIESEL



That's Superintendent R. L. Morrison of Snyder Brothers, Inc. in Cowansville, Pa., talking—and he's talking about the 34 GM Diesels his company uses in their coal, stone and sand business.

The Company has five different models from the GM Diesel All-Purpose Power Line powering pumps, dozers, graders, draglines, loaders, compressors and generator sets. Yet they back up all these engines with "only a handful of injectors and about $10 worth of gaskets."

They put cylinder kits in one engine last winter—and in a second last fall. Mr. Morrison figures he won't need any kits this winter.

Snyder's GM Diesels are up to 16 years old—some have better than 10,000 hours on them. Mr. Morrison expects the "6-71's" on his generator sets to clock 15,000 hours before overhaul. And when overhaul time does come around, it will be mighty cheap—it cost them only $300 to rebuild the "Jimmy" in their Le Tourneau-Westinghouse Super C Wagon after 6 years' service.

Keeping your engines out of the shop and on the job—cutting down on your parts stocks—spending only pin money for parts—are three good ways to boost your company's productivity and profits. Snyder Brothers is doing all three with "Jimmys" and you can, too. See your GM Diesel distributor—he's in the Yellow Pages under "Engines, Diesel"—or write direct for more information.

GM DIESEL

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS, DETROIT 28, MICH.

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario
Parts and Service Worldwide

GM DIESEL ALL-PURPOSE POWER LINE sets the standard of Diesel productivity

Metallurgical Memo from General Electric

Bit illustrated: CCS-3

Teeth that bite off big tonnage!

the proof of Carboloy® bit life is in the output

That's why so many mine operators now standardize on G-E Carboloy bits

You can expect the lion's share of coal to be mined per shift and *get it* with Carboloy mining machine bits. Replacement with these longer-life cutting tools is the best possible protection to the earning power of your equipment.

The quality of the carbide, the extra length of the tips, and the strong braze team up to keep your machines producing longer, where they work and earn. Insist on the genuine Carboloy bits—the silver color tools. Your local Authorized Carboloy Mining Tool Distributor has the right bit for every mining job. He and our local engineer are equipped to give you all the facts, as well as underground assistance. See distributor listing on adjoining page. Call him, or write: *Metallurgical Products Department of General Electric Company, 11145 E. 8 Mile Rd., Detroit 32, Michigan.*

AD Style
Auger Bit (Square and Hex shank). Designed for top performance under all cutting conditions.

CC-12 Style
Enclosed Tip Machine Bit For New Style Block. The carbide tips are enclosed in steel, resist breakout or tip loss. Also available with on-top tip.

CARBOLOY®
CEMENTED CARBIDES
METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS
MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

Complete service through factory and distributor assistance

AUTHORIZED CARBOLOY® MINING TOOL DISTRIBUTORS

ALABAMA
Birmingham 2—Shook & Fletcher Supply Company

COLORADO
Denver—The Mine & Smelter Supply Company

ILLINOIS
Mt. Vernon—Pickard Industries, Inc., Central Mine Supply Division

INDIANA
Terre Haute—The Mine Supply Company, Inc.

KENTUCKY
Harlan—Kentucky Mine Supply Co., Inc.
Lothair—Speck Cornett Distributor, Inc.
Madisonville—Pickard Industries, Inc., Central Mine Supply Div.
Paintsville—Farmers Supply Co.
Pikeville—Big Sandy Electric & Supply Co.

OHIO
Cambridge—Cambridge Machine & Supply Co., Inc.

OREGON
Portland—J. E. Haseltine & Company

PENNSYLVANIA
Charleroi—Mining Tool Service
Lee Supply Co.
Washington—Fairmont Supply Company

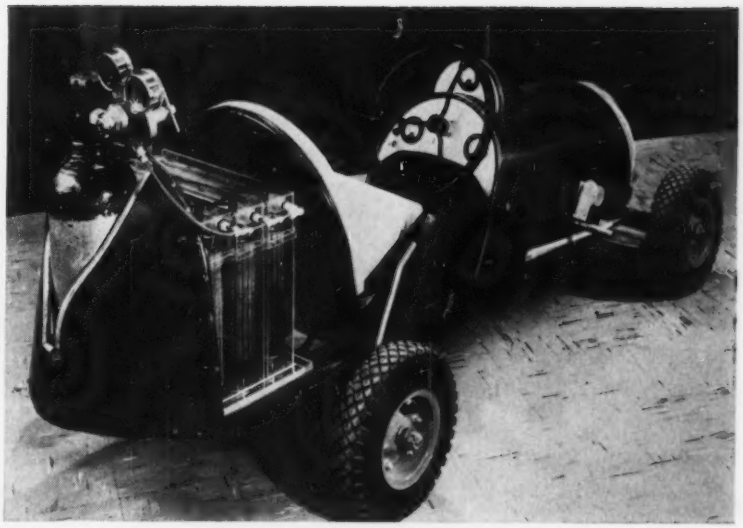
TENNESSEE
Knoxville—Crowell Engineering Company

TEXAS
El Paso—The Mine & Smelter Supply Co.

UTAH
Salt Lake City—The Mine & Smelter Supply Co.

VIRGINIA
Andover—Central Supply Co., of Va., Inc.
McClure—Erwin Supply Company

WEST VIRGINIA
Bluefield—Bluefield Supply Co.
Bluefield—Fairmont Supply Company
Bluefield—Rish Equipment Company
Charleston—Rish Equipment Company
Clarksburg—Rish Equipment Company
Fairmont—Fairmont Supply Company
Montgomery—Marathon Coal Bit Company, Inc.
Shinnston—Erwin Supply Company



Future Locomotive Power?

POWER for this electric racer is provided by prototype fuel cells using oxygen (at a 9-psi pressure) and zinc. Capacity of the unit on the racer, behind the seat, is approximately 200 amp-hr. High capacity in small space plus operation at normal pressure and temperature should make it a serious contender in the motive-power field, according to its developer, the Exide Industries Div. of The Electric Storage Battery Co., Philadelphia.

The cell may be designed for electrical recharging after 16 to 24 hr to restore its full power potential, or the electrodes may be replaced in their entirety to permit continuous operation.

Cost of use of the unit is expected to compare with lead-acid batteries or diesel or gasoline engines. As part of the development program, Exide has signed agreements with 12 industrial truck manufacturers for the development of a commercial unit. Other possibilities include all types of locomotives from mine to railroad, as well as trucks and autos.

News Roundup *(Continued)*

rock at a pitch of 16 deg to the coal seam lying at a depth of 400 ft.

Mine No. 1, which is fully mechanized and modern in every respect, is being developed and operated by Alabama By-Products Corp., as agents for Southern Electric, on a management-fee basis. It has a rated capacity of 1½ million tons per year.

Construction of Mine No 2, located near Maylene, Ala., commenced in July, 1958. It is designed to produce 500,000 tons per year, by January, 1962.

Capitol Comments

With reference to a news story on p 59 of the March, 1960, Coal Age, concerning sales of coal to the government by Capitol Coal Sales, R. C. George, Capitol president, writes in part as follows:

"The District Court for the District of Columbia did not have before it the validity of an order forbidding Capitol from doing business with the government, nor was H. A. Worley in any capacity involved in the litigation . . .

"The facts of the case are that R. C. George, doing business as Capitol Coal Sales, filed a complaint in the Federal Courts asking for a declaratory judgment as to whether the Secretary of Labor could group six individual contracts, for less than $10,000 each, together in order to acquire a money sum in excess of $10,000, which sum is required for jurisdiction to hold a hearing.

"The six contracts in question were not awarded to Capitol by TVA. The jurisdictional question was then the only issue before the court. The court ruled the six contracts should be considered as one and could be combined. The judge made no ruling as to the findings made by the Secretary of Labor, since that was not before him.

"The Worley Coal Co. was not involved in this case, and for your information, on Feb. 19, 1960, before your March issue of *Coal Age* appears to have been published, the United States Court of Appeals for the District of Columbia issued an order enjoining the Secretary of Labor from taking any action to list Capitol Coal Sales or R. C. George on the ineligible list, and the last sentence of your article is highly prejudicial to Capitol Coal Sales."

only

FLUOSOLIDS®

combines...

- compact, unitized design
- pulverized coal fuel system
- pressurized operation
- uniform control
- adaptability to all tonnages and feed sizes

for simplest, most economical

Since the Dorrco® FluoSolids System for coal drying was introduced by Dorr-Oliver on a commercial basis in 1954, its phenomenal success has caused a revolution in coal drying techniques. Despite advances made in other systems, the basic simplicity and efficiency of the Dorrco design have remained unchallenged.

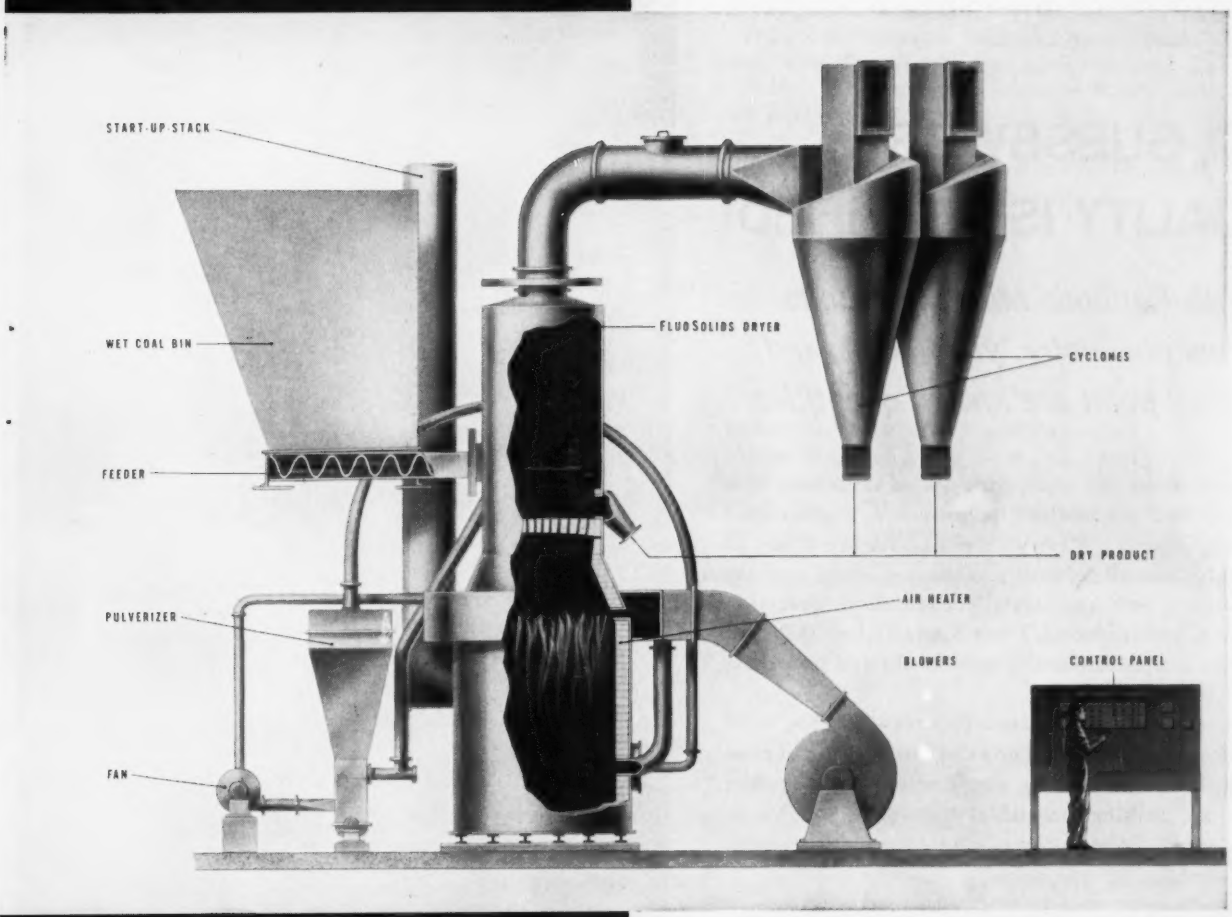
The Dorrco FluoSolids System is the only coal drying equipment combining the following advantages:

COMPACT, UNITIZED DESIGN: Air pre-heating and coal drying are carried out in a single basic unit, without the need for a separate furnace, stokers, or other auxiliary equipment. Space is conserved, installation simplified and maximum use made of heating BTUs.

PULVERIZED COAL FUEL SYSTEM: The modern Dorrco design includes a system for burning pulverized coal automatically extracted from the drying compartment. Rapid start-ups and shut-downs are possible and no fuel is burned during shut-down as in banked stokers. No ash handling equipment is required. The system lends itself to accurate, automatic control, with quick response to varying feed conditions.

PRESSURIZED OPERATION: Pressurized hot air supplied to the drying compartment improves drying efficiency, eliminates the need for an exhaust fan to handle dirty and corrosive exhaust gases. Compared with other systems, lower air volumes are required with corresponding savings in horsepower. Easily controlled humidity conditions prevent overdrying and promote maximum cyclone efficiencies.

UNIFORM PRODUCT CONTROL: Feed rate adjusts automatically with variations in moisture to give uniform drying and complete control of product.



coal drying

ADAPTABILITY TO ALL TONNAGES AND FEED SIZES: The Dorrco FluoSolids System is applicable to operations as high as 800 TPH in a single unit. Feeds can vary from filter cake to 1½" x 0 coal.

The FluoSolids Dryer is the most advanced equipment available to meet today's demands for automation and efficiency in economical preparation plant operation. For information on its application to your particular specifications, write Dorr-Oliver Incorporated, Stamford, Connecticut.

HERE'S HOW THE DORRCO FLUOSOLIDS SYSTEM OPERATES:

The drawing above shows the essentially simple operation of a typical FluoSolids coal drying system. The basic unit is a combined air pre-heating chamber and drying compartment separated by a constriction plate. Heat is generated in the lower chamber by burning coal which is withdrawn automatically from the drying unit above and pulverized before being supplied to the burner.

Hot gases under moderate pressure, tempered by the introduction of additional air from a bustle pipe midway around the heater, rise through the constriction plate into the dryer. Wet feed is automatically conducted into the drying compartment by a screw conveyor.

The action of the pressurized gases "fluidizes" the incoming coal, holding it in suspension so that every particle is surrounded by a film of hot gas causing extremely rapid heat transfer rates. Consequently, water evaporation is practically instantaneous. Finer fractions of dried coal are carried upward and collected by a cyclone system. No exhaust fan is needed. Larger coal particles are automatically and continuously discharged.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

NO GUESSWORK... QUALITY IS CERTIFIED!

With Republic Mine Roof Bolts steel chemistry, yield point, and break point are known quantities

Republic takes the guesswork out of mine roof bolt buying. You get certified performance. Performance you can depend on every time, because every step of Republic Mine Roof Bolt manufacture—from raw ore to finished bolt—is carefully controlled, precision checked, and inspected. Every Republic bolt shipment includes a certificate stating specific physical properties of the steel used.

Five certified-performance features—you get them only from Republic—add up to an extra margin of mine safety. Economy? Mining companies report Republic Bolts are making profitable operations possible in areas where the high cost of shoring could force mine shutdowns.

Because mine roof bolts can be used effectively in many different types of strata, no single design is best for all applications. Republic's Field Service Team has worked with mine operators in every part of the country to develop bolts to best meet specific requirements. This obligation-free service is available to you. Write or send coupon today.

1 PRECISION-TAPERED PLUG

Engineered for proper shell expansion. Precise degree of taper required for strength, dependability, efficient tightening.

2 HIGH-STRENGTH, ALL-PURPOSE EXPANSION SHELL

Wide, strong leaves mean extra holding power. Narrow base supports for easy expansion, wedge-like grip.

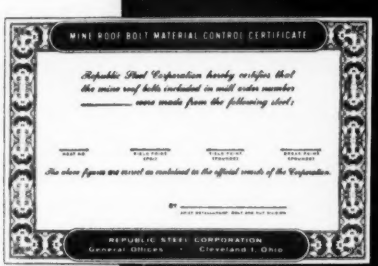
3 HEAVY-DUTY SUPPORT NUT

Provides better support for shell than previous methods. By stripping without damage to bolt threads at 50 pounds torque, proper tension in the installed mine bolt is assured.

4 IMPROVED SELF-CENTERING HEAD Compact, one-piece head. No separate washer needed. Forged for ruggedness and strength.

5 MATERIAL CONTROL CERTIFICATE

Included with every shipment. States specific physical properties of the steel used: yield point, break point, and steel heat number.


MINE ROOF BOLT MATERIAL CONTROL CERTIFICATE

Republic Steel Corporation hereby certifies that the mine roof bolts enclosed in mill order number _____ were made from the following steel:

The above figures are correct as contained in the official records of the Corporation.

BY _____

REPUBLIC STEEL CORPORATION
General Offices • Cleveland 1, Ohio

REPUBLIC STEEL

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

CORROSIVE ELEMENTS,

and moisture, found around mining operations, are tough on standard conduit. Answer: *Republic* ELECTRUNITE® *"Dekoron®-Coated" E.M.T.*, made from highest-quality flat rolled open hearth steel, armor-coated from end to end with corrosion-proof polyethylene. Easy to cut to length and bend to fit installation. ELECTRUNITE "Dekoron-Coated" E.M.T. costs less to install, less to maintain. Plastic coated rigid steel conduit also available. Mail coupon for more information.

ABRASION-RESISTING PERFORMANCE

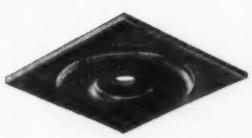
of *Republic High Strength Steel* makes it ideal for use in coal and ore discharge chutes, hopper and mine cars. Equipment built with Republic High Strength Steel withstands continual pounding and abrasion, is more corrosion-resistant and weighs less than similar equipment constructed of plain carbon steel. Send coupon for additional information.

MINE WATER PROBLEMS?

Solve them the easy, low-cost way—with *Republic Flexible Plastic Pipe*. Made of tough polyethylene, it is impervious to corrosive elements found in mine water. Lightweight Republic FE® Plastic Pipe is easy to handle, easy to cut and join. Can be quickly relocated to meet changing conditions. Mail coupon for further information about Republic Plastic Pipe.

AVAILABLE PRE-ASSEMBLED
TO CUT YOUR INSTALLATION COSTS

You can order your Republic Certified-Performance Roof Bolts fully assembled to save you assembly costs, prevent loss of parts and damage to bolt threads. Specify Republic Roof Bolt Plates, too.



REPUBLIC STEEL CORPORATION
DEPT. CA-9670
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send me further information on:

- ☐ Republic Mine Roof Bolt Field Service
- ☐ Mine Roof Bolts ☐ High Strength Steel
- ☐ Plastic Pipe
- ☐ ELECTRUNITE "Dekoron-Coated" E.M.T.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Get DOUBLE EXPANSION for DEPENDABLE roof support with PATTIN roof bolts and expansion shells

STYLE D-1

The unique double expansion feature of all Pattin expansion shells insures *dependable* roof support, in hard or soft roof conditions. Their double holding power guards against failure — even under a 20 ton pull!

Pattin features include a parallel contact with the hole, and no definite drilling depth is required, as the shell can be securely anchored at any place in the hole. They anchor solidly and will not turn while being tightened. Wedge and shell are assembled in a manner to prevent loss of parts in handling, and the bolt and shell assembly are furnished as a complete unit. Plates are bundled separately. No special nuts or ears are required on the bolts. These features make a safer roof — and a safer roof means fewer accidents, increased production, more clearance for equipment operation and better ventilation.

Pattin specializes in roof bolting —it's our business, not just a sideline! Your business is important to us, and our service engineers are always available for consultation on your roof problems—ready to give you service when you need it! WRITE OR PHONE US TODAY for complete details.

Reg., U.S. and foreign Pat. Offices

The PATTIN split-type BOLT

The split-type bolt is one of the first slotted bolts, and continues to be a favorite wherever split-type bolts are used. Many mines still prefer this type. The bolt is a full 1-inch in diameter, with cut threads and furnished with hex or square nuts and various size plates and wedges.

IN WESTERN STATES

Pattin expansion shells are available and serviced exclusively by Colorado Fuel and Iron Corporation, Denver, Colorado. Western mining companies should contact them direct for information and consultation.

PATTIN
MANUFACTURING COMPANY
MARIETTA, OHIO

The PIONEER of roof bolting . . . established 1888

INSIDE a coal mine, Secretary of the Interior, Fred A. Seaton (right), gets first-hand information on the coal industry from George A. Shoemaker (left), new president of Consolidation Coal Co., and Stephen F. Dunn, president, National Coal Association. So far as it is known, it is the first time a Cabinet member has ever been in a coal mine. The tour, which took place in Mathies mine, Washington County, Pa., took place during the May meeting of the American Mining Congress, in Pittsburgh. Mathies mine was named for Archie Mathies, Congressional Medal of Honor winner, who had been an employee of Pittsburgh Coal Co. before entering World War II, during which he died in a plane mission over Germany.

COAL CLEANING made easier with

MAGNAFLOAT®

MAGNAFLOAT... Foote's specially processed magnetite— has what it takes for fast and efficient heavy-media separation of clean coal from refuse in raw run-of-mine:

- **low cost**
- **high magnetic susceptibility**
- **low consumption per ton of cleaned coal**
- **minimum abrasion and corrosion of equipment**
- **wide range of media densities**
- **shipped promptly**

This popular ferrous medium is available in three grades: A Grade (max. 5% on 100 mesh, 55-70% thru 325 mesh); B Grade (90% min. thru 325 mesh); C Grade (all thru 65 mesh, approx. 50% thru 325 mesh). Write for details.

FOOTE MINERAL COMPANY
470 Eighteen West Chelten Building
Philadelphia 44, Pa.

AFTER 30 YEARS ON THE JOB . . . Okolite insulation still looks good. This unretouched photograph shows a section of 11.5 Kv power cable recently re-assigned by Duquesne Light Company. Note that the insulation is still flexible and resilient—workable. Tests made this year show the tensile strength has deteriorated very little, remaining more than 33% above the original specification figure.

30-year-old Okonite cable still tests above specification figures . . .

This is CABLE'BILITY *a new word for your vocabulary*

Cable'bility (cā'ble·bil'·i·ty) *new word. Noun.* **1.** Ability to design and manufacture electrical cables that give outstanding performance. **2.** Having long background and wide experience in cable research and application. **3.** Possessing keen understanding of customers' problems. Implies eagerness to serve faithfully and dedication to progress. **Syn.** The Okonite Company.

This is Okonite Cable'bility at work. It's "Old Faithful"—a 1250 MCM, Okolite-insulated power cable made in 1929, now carrying on a new career as a mine power feeder for Duquesne Light of Pittsburgh.

"Old Faithful" began service as an 11.5 Kv lead from switchyard to transformer, handling 15,000 KVA loads. During World War II, it saw fifteen years of full load operation, 24 hours a day. Then in 1957 it was replaced with a larger cable to handle even greater loads. But it was found still suitable for demanding tasks as a power feeder.

There are Okonite "Old Faithfuls" in use today in every application . . . *yours* too. Because, as in 1929, Okonite still produces the most dependable cables on the market. The reason is Cable'bility. The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

***where there's electrical power . . . there's* OKONITE CABLE**

6959-A

CATERPILLAR ANNOUNCES 2 NEW

NEW 150 HP 977H WITH 2½ CU. YD. BUCKET

Travel speeds: Forward—Low: 2.0 MPH 1st; 3.6 MPH 2nd. High: 2.5 MPH 1st; 4.7 MPH 2nd. Reverse speeds 25% faster than forward.

NEW 100 HP 955H WITH 1¾ CU. YD. BUCKET

Travel speeds: Forward—Low: 2.1 MPH 1st; 3.9 MPH 2nd. High: 2.7 MPH 1st; 4.9 MPH 2nd. Reverse speeds 25% faster than forward.

TRAXCAVATORS

with Power Shift Transmission and Live Action Hydraulics

977 SERIES H
955 SERIES H

all new for new high production

There is a way to beat higher costs—and that's with increased production. For tractor-loader jobs, here's your answer in the new Series H Cat 977 and 955 Traxcavators. Designed to set a production pace far faster than the models they replace (and other makes of comparable size), they're milestones in tractor-loader progress. With power shift transmission and Live Action Hydraulics, they're the loaders *that never stop.*

There may be machines in your line-up that are no longer paying their way—or not earning *all* the profits they should. A comparison of your existing loaders with the new Series H Traxcavators could easily prove these new machines would increase your output and profits far more than you imagine. Get the facts from your Caterpillar Dealer. Ask for a demonstration, too. See for yourself how they set a new production pace on the toughest kind of job.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U. S. A.

CATERPILLAR

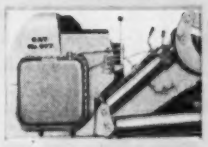
Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

TRAXCAVATORS ARE MAKING OTHER LOADERS OBSOLETE

NEW HIGH PRODUCTION FEATURES SPEED LOADING, LIFTING, HAULING, DUMPING . . . THE FULL CYCLE

NEW POWER SHIFT TRANSMISSION

One lever—that's right, one lever gives split-second changes in speed or direction to slash cycle times and increase operator efficiency.



NEW LIVE ACTION HYDRAULICS

Another Caterpillar development! Live Action Hydraulics provide faster lifting speed and greater lifting capacity without robbing power from the tracks. The 977H Traxcavator packs 41% more hydraulic lifting power—the 955H, 23% more than former models.

MORE HORSEPOWER WITH NEW CAT TURBOCHARGED ENGINES

Up 50% on the 977H—its new Cat D333 Engine develops 150 HP at the flywheel. Up 43% on the 955H with a new Cat D330 Engine that develops 100 flywheel HP.

NEW INCREASED BUCKET CAPACITY

An 11% increase on the new 977H with new 2½ cu. yd. bucket—and a 16.6% increase on the 955H with new 1¾ cu. yd. bucket. Complete redesign of engine, power train and chassis provides new machine balance to handle the heavier loads.

NEW HEAVY-DUTY UNDERCARRIAGE

Many new features, including larger, stronger track components that also increase stability . . . lifetime lubricated rollers with patented floating ring seals need no servicing . . . and track guiding guards welded to the roller frame for positive track alignment. The 955 Series H Traxcavator also features a new 6-roller track frame and hydraulic track adjusters, both standard equipment.

MORE HIGH PRODUCTION FEATURES

A new, two-cylinder gasoline starting engine for positive starts in any weather . . . and a new dry-type air cleaner that removes at least 99.8% of all dirt from intake air in the worst dust conditions, cuts maintenance time as much as 75%. Retained features include 40° bucket tilt back . . . automatic bucket positioners and kick out . . . 3-grouser track shoes.

QUICK-CHANGE ATTACHMENTS

Bar none, Traxcavators are the most versatile machines you can use. With attachments, you can always keep them working—and working profitably. Attachments available for the new 977 and 955 include the Side Dump Bucket, Rock Bucket, Quarry Bucket, Bulldozer, Ripper and Log and Lumber Forks.

Mines, Companies

Two new strip mining operations in Walker and Tuscaloosa Counties, Ala., have been announced.

DeBardeleben Coal Corp., Birmingham, Ala., has leased land along the Warrior River in Tuscaloosa County. It will supply about 250,000 tons of coal per year to Alabama Power Co. plants in the Mobile area, barging the coal down the river. Bankhead Mining Co., Jasper, Ala., has entered into a contract with Alabama Power to furnish about 250,000 tons a year for the power firm's Gorgas plant. The mine will be on Alabama Power land in Walker County.

Crow's Nest Pass Coal Co., Fernie, B. C., approved granting of an option allowing U. S. Steel Co. to explore Crow's Nest coal land over the next 4 yr.

Under the option terms, Columbia Iron Mining Co., wholly-owned subsidiary of U. S. Steel, would spend $500,000 in exploration with the right to purchase a substantial part of Crow's Nest's properties for $10 million, or all of the property for $17 million.

Utilization

The Tennessee Valley Authority has announced it wants to buy a device to detect any recurrence of fraudulent coal deliveries at its Kingston steam plant.

Several coal operators lost their contracts with TVA, it is understood, when TVA said the operators were delivering waste coal after covering it with a layer of top-grade coal.

Coke manufacturing plants carbonized 117,000 tons or 46% more anthracite in the 12 mo ended Feb. 29 than in the previous year, the Anthracite Institute reported recently. This was based on monthly reports of the Bureau of Mines.

Because of their policy of inventory reduction, however, coke manufacturers actually purchased 144,000 tons or 65% more anthracite than a year ago, the report noted.

Anthracite is reported to have saved a Philadelphia apartment house some $4,300 over the last two years, compared with oil.

Lakeside Apartments reported that in two previous years the annual fuel oil costs were $16,000 and $19,000 respectively. The first complete year with EFM automatic anthracite Fire-Jet burners, the fuel costs added up to only $13,000. Compared with the high average oil year it saved $5,800. In addition, the management reports, "we have maintained steady heat in all apartments 24 hr a day and an inexhaustible supply of hot water.

Preparation Facilities

Winding Gulf Coals, Inc., Maben, W. Va.—Contract closed with The Deister Concentrator Co., Inc., for eight Concenco No. 77 Diagonal-Deck washing tables for cleaning ¼x0 coal.

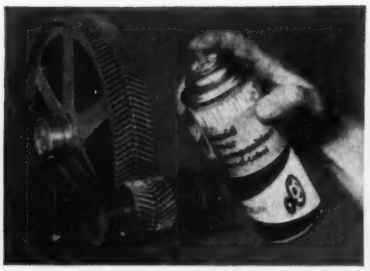
Perkins Harlan Co., Liggett, Ky.—Contract closed with The Jeffrey Mfg. Co. for a No. 200 unit washery to handle 150 tph of 1x¾ coal.

United States Steel Corp., Robena-Greensboro, Pa.— Contract closed with Link-Belt Co. for a heavy-media vessel to handle 300 tph of 3x¼ coal.

Island Creek Coal Co., Algoma plant, Algoma, W. Va.—Contract closed with Wecmo, Div. of Western Machinery Co., for installation including two 4-cell banks of No. 66 Fagergren flotation units to treat circulating water with about 20 tph of solids.

TRIAL SAMPLES

Of World-Famous WHITMORE'S Lubricants NOW IN AEROSOL SPRAY-ON CANS!



HANDI-LUBE LIQUID GEAR COMPOSITION

For open gears, sliding surfaces—exclusive formulas eliminate metal to metal contact, keep wear on the lubricant not the metal —no breakdown even after prolonged use under water—available for every climatic condition—packaged in handy 16-oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

WIRE ROPE SPRAY LUBRICANT

Exclusive formulas for lubricating and protecting wire rope, chain, springs. Penetrates to the core of wire rope minimizing internal friction and increasing usable life up to 300% —special protective qualities absolutely eliminate corrosion—non-gumming qualities reduce "carry-back"—packaged in handy 16 oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

65 YEARS OF LEADERSHIP LUBRICATING THE FOLLOWING:

- Open Gears, Dipper Sticks, Cams
- Enclosed Gear Cases
- Wire Rope and Cable
- Hydraulic Units, Torque Converters
- Roller, Ball, and Sleeve Bearings
- Speed Reducers

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THE WHITMORE MANUFACTURING CO.

LUBRICATING ENGINEERS

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Meetings

Tenth Annual Short Course on Coal Preparation, June 6-July 15—School of Mines, Extension Dept., West Virginia University, Morgantown, W. Va.

Short Course in Coal Mining, June 6-July 29—West Virginia University, Morgantown, W. Va.

Rocky Mountain Coal Mining Institute, annual meeting, June 26-29—Hotel Colorado, Glenwood Springs, Colo.

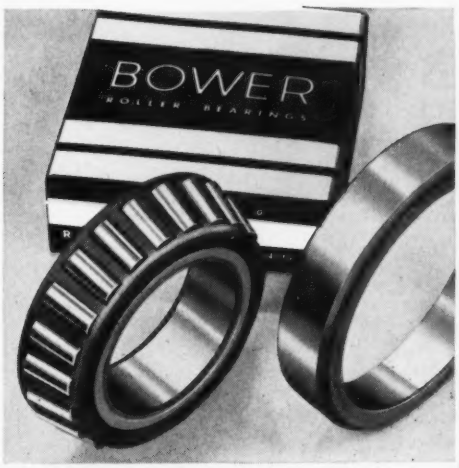
National Safety Congress, 48th annual meeting, Oct. 17-21 — Conrad Hilton Hotel, Chicago.

Biannual Symposium on Drilling & Blasting, Oct. 17-19 — Colorado School of Mines, Golden, Colo.

Coal Mining Institute of America, 7th annual meeting, Dec. 15-16—Sheraton Hotel, Pittsburgh, Pa.

Better products, *faster,* from your Bearing Specialist:

Bower Roller Bearings give belts a boulevard ride... better for every kind of replacement!



Favorites of equipment builders and men who must keep big loads rolling!

You can be sure of keeping your equipment rolling and earning even under the roughest conditions. Bower builds in longer life, easier running refinements that pay off in high tonnage service. Bower tapered roller bearings are Spher-O-Honed . . . roller heads are spherically contour-ground. They need no run-in. Extra-high flanges cut unit pressure—improve alignment. Oil grooves are bigger for positive roller lubrication. Honing processes super-finish inner and outer races for smoother rolling action. All these combine to add longer life and lower maintenance cost.

Bower builds both tapered and straight roller bearings. Your Bearing Specialist stocks both types . . . and gives fast delivery on each. Call him anytime.

BOWER ROLLER BEARINGS

FEDERAL-MOGUL SERVICE

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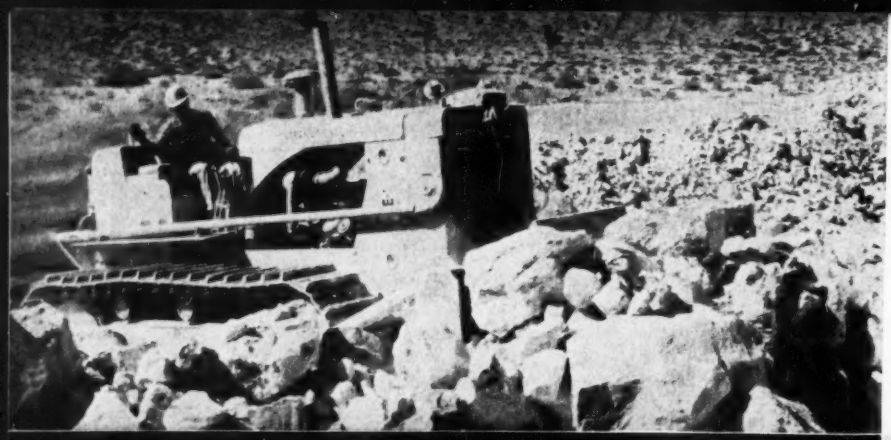
BEARING BOWER ROLLER BEARINGS SERVICE



Even moving a blade-full of shot-rock around the curve, there's no hesitation, no sluing to spill the load. The TD-25's operator has separate speed control of each track to get full-capacity performance, full time. And only the new TD-25 has the power plus of the direct-start, turbocharged DT-817 International engine—that delivers 230 high-torque hp!

HOW POWER-STEERED, POWER-SHIFTED . . . TD-25 takes

—on California mining operation

Even before all the blast dust has settled, this International TD-25 is slamming tons of shot-rock from the benches, so trucks can resume hauling to the processing plant. Then, at this gypsum mine in California, the "25" takes over the "shovel-feeding" chore—dozing full blades of rock upgrade, downgrade, and 'round the curves, to help keep the big dippers swinging full. And in between times, the "25" takes over its third tough project: benching new haul road around mountain slopes!

Three slam-bang rock operations to handle—it's a made-to-order situation for the Planet Power-steered TD-25!

"Dead-track drag" eliminated! You don't brake a track and "half-kill" your pull-power to turn, as you do with king-sized clutch-steered crawlers. With Planet Power-steering you simply change the speed of one TD-25 track—on-the-go, and with 2-finger ease! Around comes the fully-loaded TD-25—with "live" power on both tracks and both tracks pulling. Load-limiting "dead-track drag" is eliminated!

And combined, on-the-go Hi-Lo power-shifting lets you match power to load, instantly—forward or reverse. Just shift one track to high range—the other to low—to do slope-hugging, full-bite benching, or to operate straight ahead with off-center loads!

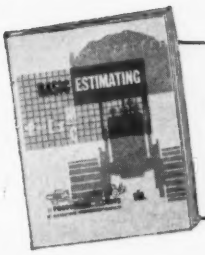
The "25" is platformed on new 7-roller tracks with double-box-beam frames. The design provides super undercarriage strength for slam-bang conditions—strength to match the full effort of the direct-start, high-torque DT-817 International Diesel engine.

Power-steer and power-shift the TD-25 with king-sized loads. Measure the bonus capacity you get with exclusive Planet Power-steering and Hi-Lo power-shifting. See how this control combination enables you to outearn other big rigs up to 50%. Then measure what it means to get this double-barreled advantage *only* in the TD-25—and as standard equipment *to boot!* Let your International Construction Equipment Distributor demonstrate.

International Harvester Co.
180 North Michigan Ave.
Chicago 1, Illinois
A COMPLETE POWER PACKAGE

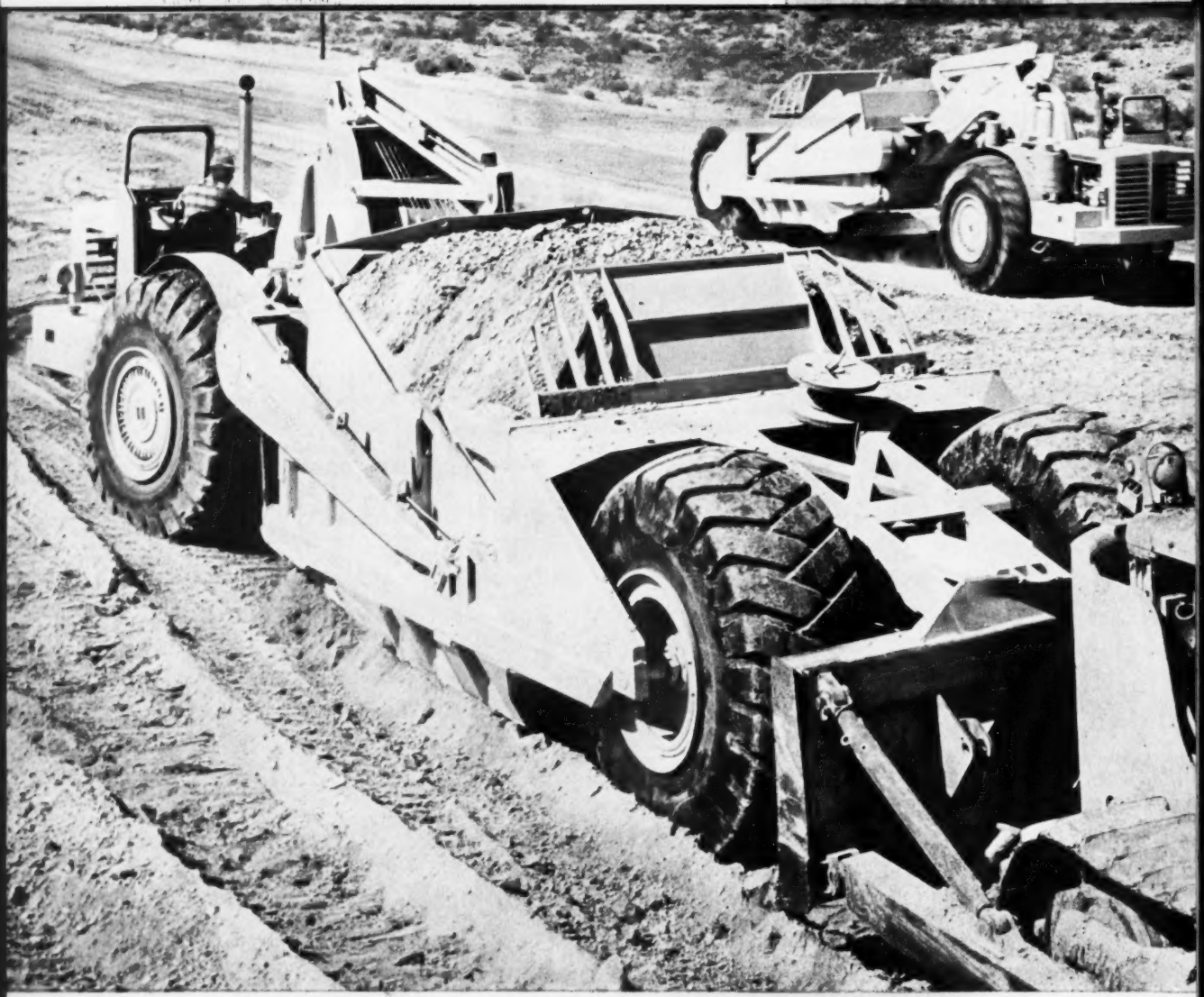
International® Construction Equipment

"Boulder-dozing" after blasting— The TD-25 does some "blasting" itself to move "big-as-a-house" hunks of rock aside. Heavy-duty TD-25 Dura-Rollers defy the rock-dozing "grind"—with the industry's thickest shells to prevent flexing—positive grit exclusion—and 1,000-hr.-interval lube capacity!



Here's your 76-page cost and production estimating book—newest, most authentic and complete guide for estimating material-moving costs—and for selecting equipment combinations for top profits, *anywhere!* Yours for the asking from your International Construction Equipment Distributor!

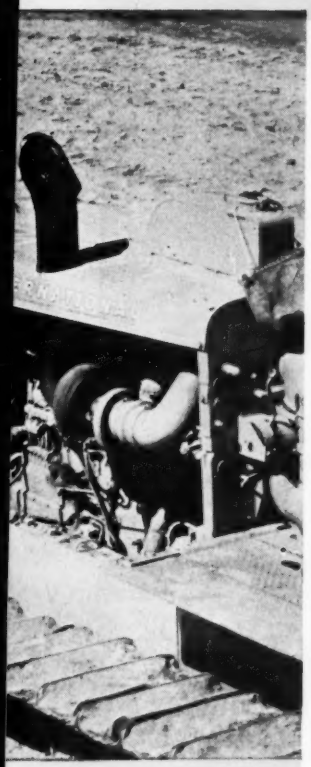
over three slam-bang rock jobs



With the planet-powered 230-hp TD-25 pushing—and with 375 high-torque International Diesel hp under the "295's" hood—you heap on 34-cu. yd. with amazing new speed. Even in toughest loading conditions, "X"-member reinforcing maintains perfect Payscraper push-frame alignment!

Note that the Payscraper apron lifts to a big 94-inch opening. Two ejector-plate pushing members apply dozer-like action to force out the whole 34-cu. yd. load cleanly. The 122-inch bowl width speeds unloading, and loading, too—adds control ease and stability, loaded or empty.

How Payscraper* power and power controls boost your dirt-on-fill delivery!



You get highest power-to-payload punch of all rubber-tired rigs in the 34-cu. yd. International 295 Payscraper. The fast-slugging, high-torque 6-cylinder International DT-817 Diesel is the Payscraper power plant.

The direct-start, 375-hp DT-817 is turbocharged to give you all-altitude, high-efficiency performance—power for cycle-speeding rim-pull—plus time-saving "no-lag" control power!

You power-shift the Payscraper, up or down—and the 4-speed planetary-type, torque-converter transmission provides load-speeding *automatic* direct-drive lock-ups in second, third, and fourth gears!

You power-steer the 150,000-lb. loaded Payscraper almost as easily as a 3,600-lb. automobile. Payscraper gives you the big control advantages of (1), exclusive International rack-and-pinion plus tandem pump steering system; and (2), 3-degree forward spindle pitch that improves scraper balance and prevents "nose-downs" in high-speed turns!

You power-control Payscraper dirt-handling actions with fingertip ease with the International PTO-driven Cable Control Unit. One cable drum of this simple planetary system actuates the apron and ejector; the other drum positions the bowl to control loading and spreading! Reach-easy Payscraper power brakes give you fast, positive stopping!

Ease into the bump-smothering Payscraper seat—press the direct-start button—power-shift the outfit into action. Compare the speed of loading, roading, and dumping the 122-inch bowl. See how the advantages of DT-817 Diesel power and complete, positive Payscraper power control can boost your dirt-on-fill delivery. Choose the 2-axle "295," or 3-axle, 34-cu. yd. "495." See your International Construction Equipment Distributor for a demonstration!

Here's your 76-page cost and production estimating book—newest, most authentic and complete guide for estimating material-moving costs—and for selecting equipment combinations for top profits, *anywhere!* Yours for the asking from your International Construction Equipment Distributor!

International® *Construction Equipment*

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE

Positive power-control of all operations adds safety, builds operator confidence — makes him "haul-speed minded" to help you get full capacity and profit from Payscraper speeds up to 33.5 mph. For example, safe, effortless tandem-pump power-steering leaves "the steering feel in the steering wheel"—gives positive, one-hand control!

Will it hold you up...

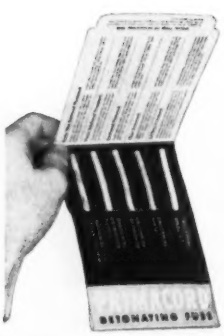
or blow you up?

Under certain conditions, a thunderstorm five miles away can be the source of extraneous electricity that *could* result in a premature blast.
This hazard is so well recognized that blasting operations are often suspended whenever a thunderstorm is detected.

There is a simple, commonsense method of reducing this lost time while minimizing the hazard of premature shots. Use Primacord as the "down line" to detonate the charges in each hole – and as "trunk lines" to connect all holes.

Primacord is a *detonating* fuse. It cannot be set off by sparks or normal vibration – and even a direct hit by lightning failed to detonate it. Its use simplifies loading, and will enable you to plan your blasts to obtain better fragmentation.

When all is in readiness for the blast then, *and only then,*
attach fuse and cap or electric blasting cap to the end of your trunk line.
With Primacord, you call the shots!



Free Sample Kit
contains dummy samples of five types of Primacord with brief description. When you write for it, tell us about the job.

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Since 1836

GUARD AGAINST STRAY CURRENT HAZARDS

Primacord®
DETONATING FUSE

P-3

Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry

COAL AGE

JUNE, 1960

IVAN A. GIVEN, EDITOR

No Magic

THE "MILLION-DOLLAR MINER" is not yet here—at least in the general type hitherto known, but it probably is not too far off. Of course, the price tag includes all the auxiliaries necessary to deliver the coal to the main line. Even now, it is easy to get up to $300,000 to $400,000 for a complete unit. Compared to conventional equipment, the investment per ton of hourly capacity is substantially greater but the payoff is—or should be—in increased output per man.

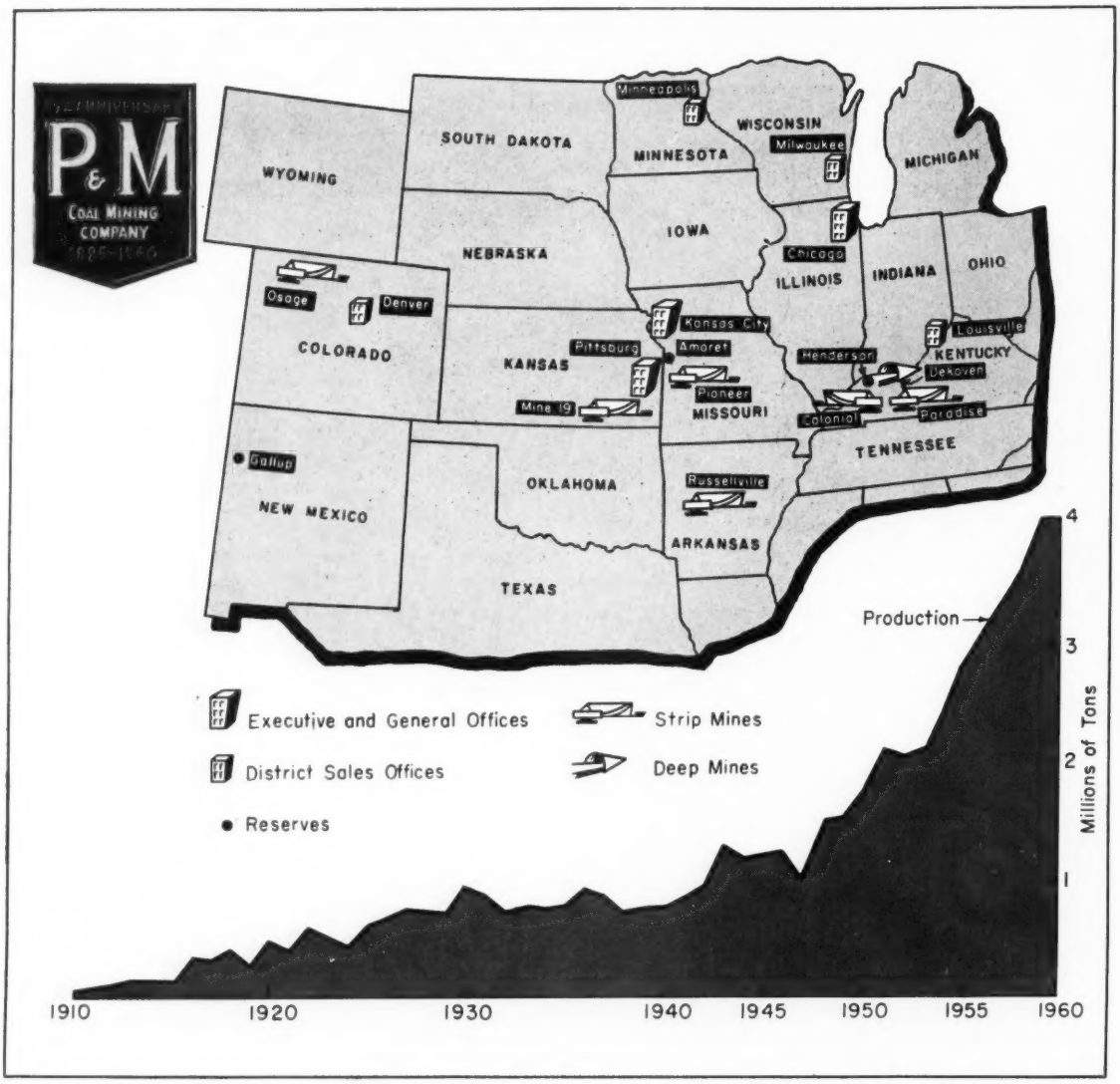
It is fairly evident that the ultimate in payoff is yet to be reached at most mines for a number of reasons, including the fact that the development of the ultimate in mining systems and maintenance is still in progress. In fact, it can be said that the ultimate even in conventional mining still is a long way off when only a few mines consistently run 800 to 1,000 tons per unit with crews of 10 men or less. True, they have some factors in their favor but at least at some of these bluechip properties conditions are no better than the usual. The answer is better management, reflected in thorough study of equipment and methods to develop the most efficient-possible system and keep the units running to take advantage of it.

There is no magic in high productivity figures. They can be achieved, and the secret is hard work to make the investment in men and machines count.

Good Subject

HOW MANY coal men are up on at least the fundamentals of direct reduction of iron ore, the fuel cell and the other new gadgets and processes that may supply us with the products and energy we will need in increasing quantities in the future? The question is asked because the publicity on these things has made an impression on many people, and a fair proportion of these people logically go one step farther and wonder what they mean to coal and the other fossil-fuel sources of light, heat and power.

Actually, there seems to be an opportunity for coal emerging. For many, it is interesting and impressive news that coal will probably be the lowest-cost source of hydrogen for direct reduction and of carbon and various gases for fuel cells. Basically, this stems from the fact that whatever you try to develop, including even nuclear power, you have to start with an existing source or sources of energy and raw material. As a result, coal pops up every time you turn around. The opportunity for increased public goodwill and respect should lie in closer identification of coal with these new processes and products—either actually in being or to be expected at some time in the future. Perhaps it's a good subject for coal men to talk about whenever the occasion arises—or can be made to arise.



FROM HUMBLEST beginnings in southeastern Kansas, P & M's operations have grown to embrace two-thirds of continental U. S. area and parts of Canada; output now puts company among "Top 15" producers.

P & M's Diamond Jubilee Story

In 1885, the Pittsburg & Midway Coal Mining Co. produced 15,276 tons; last year, 4,142,076 tons. Capacity, now in excess of 5,000,000 tons is headed for 6,050,000 tons. Behind the P & M story:

- Aggressive leadership in pioneering more efficient methods and equipment for mining, preparing and merchandising coal.
- Foresight in planning for continuity of management leadership, and in acquiring reserves to replace and expand capacity.
- A deep-seated sense of loyalty and service to employees, customers and the community.

By W. A. Raleigh Jr.
Associate Editor, *Coal Age*

WHAT MAKES some coal companies grow and prosper to bigness while others just get along? Once graduated, how does the big company perpetuate growth and expansion? Following interviews with officials of the Pittsburg & Midway Coal Mining Co., celebrating its 75th anniversary this month, *Coal Age* distilled answers to both questions as follows:

1. Develop and maintain a long-range management approach which aims at profits-stability and growth through increasing production and cutting costs.

2. Build into this approach alertness and responsiveness to new or improved methods for mining, preparing and marketing a low-cost, high-quality product.

3. Set a framework for capacity-expansion by acquiring reserves in anticipation of future development and to replace coal currently being mined.

4. Make a conscious, continuous effort to instill employee-, customer- and community-confidence in company practices.

5. Plan today for continuity of management leadership tomorrow.

Few bituminous companies could provide better case-history answers to sustained growth and expansion.

The Pittsburg & Midway Coal Mining Co. was incorporated in 1885. During that year the firm produced 381,907 "bushels" of coal (15,276 tons) from three mines in southeastern Kansas—"Mine Number Zero," "Shaft Mine Number One" and "Shaft Mine Number Two." From such humble beginnings P & M has risen to top-drawer status regionally and nationally.

In terms of physical size, as shown by the accompanying map, mines and markets embrace two-thirds of the continental U. S. area. The company operates three large mines east of the Mississippi River—two strip and one deep—in western Kentucky. West of the Mississippi, four strip mines are operated in Kansas, Missouri, Arkansas and Colorado. Sales offices in each of these states, plus Wisconsin and Minnesota, serve Midwestern, Western and Canadian outlets. Total employment, including mine, supervisory and office personnel, is counted at 787.

In terms of production volume, P & M last year added new laurels to the long record of growth delineated in the accompanying chart. For the first time, *Keystone Coal Buyers Manual*, a McGraw-Hill affiliate of *Coal Age*, reported, the company broke into the ranks of the "Top 15" with output initially estimated at 3,936,051 tons and later finalized at 4,142,076 tons. Of this total, 67% was marketed to utilities, 22% to general industrial consumers, and 11% to railroads and retail dealers. Production capacity, now in excess of 5,000,000 tons and headed for 6,050,000 tons, is backed up by estimated reserves of 477 million tons.

Evidencing the momentum and force of its growth, P & M jumped to 15th position in national tonnage-rankings from 19th in 1958, 24th in 1957 and 29th in 1956. Also to its credit, the firm posted a 7.8% increase in tonnage during recession-year 1958, while all others now listed in the "Top 15" registered decreases. And this year, as industry production so far runs nip-and-tuck with 1959, P & M is clipping along at an annual rate about 11% ahead.

"The outlook for the coal industry is bright," President Phelps states. "Coal is the energy source which, in the future, will increase the least in price and have less price fluctuation.

"Demand from utilities and industry in general will increase and purchasing will be done on the basis of heat units and service instead of tons. This trend, which is the highlight of coal marketing today, will continue at an accelerated pace.

"Utility and industrial loads will gross lower realization than domestic and railroad markets but the transition can be made by building up volume and efficiency. Pittsburg and Midway has met this challenge and is looking forward to continued growth and expansion."

Growth Keys: Aggressive Leadership; Foresight

P & M's status as one of the Nation's top-ranking bituminous firms stems from considerably more than physical size and production volume.

The total operation is buttressed by a hard-hitting, well trained sales force and sound administrative practices, which include a workable system of managerial development, continuous monthly cost-analysis and control, and a conservative dividend policy which allows for regular build-up of working capital.

A vigorous personnel and public-relations program has brought the company widespread recognition for safety and reclamation achievements, and immeasurable benefits from employee loyalty. Records show personnel turn-over is "practically zero—usually employees leave only when they die or retire."

Essentially, however, P & M's position today is due to traditions of aggressive leadership and foresight started in 1911 when Charles F. Spencer assumed presidency of the company.

"For 31 yr, until his death in 1942, the vision, enterprise and courage of Charles F. Spencer guided the destinies of the Pittsburg & Midway Coal Mining Co.," a company report states. "It was his vision which could foresee in the little shallow shafts of a half a century ago, the Middle West's foremost mining operations; his enterprise which converted these mines to practical strip mining, built the first pilot washery and developed it into a huge and efficient coal cleaning plant."

Counted as major milestones during Charles Spencer's presidency were the following:

1915—Shaft Mine No. 8 converted to a strip mine and one of the first big shovels of the day (7-yd bucket capacity) put into operation.

1918—The first 225-B electric stripper installed in the new No. 10 Mine, near Midway, Kan.

1927—The first 10-yd shovel ever built, a 320-B electric unit, then the largest, installed at Mine No. 10.

1929—Again the largest excavating shovel in the world to date, a 750-B electric unit installed at Mine No. 10.

1931—The company's first washery for the removal of free impurities from coal built at Mine No. 10.

1933—Plant erected at West Mineral, Kan., prepared coal from No. 15 and No. 17 mines—the first time for central cleaning.

1936—The first plant for the recovery of a valuable by-product, pyrites, from coal refuse put into operation by the Mineral Products Co., a P & M affiliate.

1938—A 33-yd 950-B electric shovel, then the largest in the world, installed at Mine No. 15, near West Mineral, Kan.

The traditions of leadership set

Perpetuating Traditions of Aggressive

KENNETH A. SPENCER, before his passing in February, 1960, was president, Pittsburg & Midway Coal Mining Co., and founder and chairman of the board, Spencer Chemical Co. His character and rare qualities of leadership have left an indelible imprint on the companies he headed as well as on the people and communities he served.

During Mr. Spencer's presidency which began in 1942, P & M experienced its greatest era of growth. All seven coal properties now operated by the firm (see main text) were opened and developed under his direction. From 1947 to 1959 these mines quadrupled company production to over 4 million tons. Furthermore, by purchasing the DeKoven property, Sturgis, Ky., he laid the foundation for current capacity expansion.

Motivated by a search to find new uses and markets for coal, Mr. Spencer took the germ seed of an idea from a small chemical venture, and molded it into one of the country's leading chemicals-producing enterprises—the Spencer Chemical Co. The seed for formation and development of this company during World War II was germinated when, in 1936, he developed a process for recovering iron pyrites from coal-mine refuse.

Mr. Spencer graduated from the University of Kansas in 1926, where he majored in geology and mining engineering. Immediately, he started work for P & M as an engineer and soon demonstrated interest in improving coal-production methods. He helped, for example, to develop a differential-density-cone process for separating impurities from coal and installed the first commercial washer in the Missouri-Kansas field.

Much of Mr. Spencer's genius as an industrial entrepreneur stemmed from inbred intuitive managerial sense. An editorial in the *Kansas City Times*, Feb. 22, 1960, put it this way:

"Mr. Spencer was an executive in the modern pattern of team players. He was the calm leader who inspired confidence, who encouraged other people to give their views of a problem and stood ready to make the final decisions. . . . It was in his nature to build a strong organization by delegating authority. Particularly, he put confidence in young men . . ."

Mr. Spencer was born in Columbus, Kan., 58 yr ago, and remained throughout his lifetime a staunch, inveterate Middle Westerner. "A man of unlimited capabilities and energy," he was an active sportsman and enthusiastic plane pilot. He served as vice president and director of the National Coal Association and as director of many corporation boards. He belonged to clubs and societies too numerous to mention. He was chairman and one of the original founders of the Midwest Research Institute, a trustee of the University of Kansas Endowment Association, and a founding member of Kansas City's Junior Achievement, Inc.

For outstanding contributions to his school, Mr. Spencer received a citation from the University of Kansas in 1943 and, in 1953, the Erasmus Haworth Award for achievement in geology. In 1956, he received the annual award of the Society for the Advancement of Management. Park College awarded him an honorary degree in 1959 and his fraternity, Beta Theta Pi, named him "Man-of-the-Year" in 1959.

HAROLD H. SPENCER, chairman of the board, Pittsburg & Midway Coal Mining Co., is the third generation of his family to be associated with the industry and has three sons active in the company—Charles F., assistant secretary and manager, Industrial Sales; William C., assistant chief engineer; and H. Hughes, comptroller. As board chairman, he is esteemed as the "stabilizing influence" for the total operation, and has been the driving force behind P & M's extensive reclamation program.

Queried by COAL AGE about the firm's heavy stake in the utility market (67% of total sales), Mr. Spencer said he looked upon this as a healthy sign.

"The utility market," he pointed out, "is substantial, and will expand. It is much more stable than the domestic market, which is inherently volatile and unsteady. Growth and steadiness

Top Management Team . . .

H. H. Spencer, chairman of the board
Edwin R. Phelps II, president
Frank Barrow, vice president, sales
D. F. McKenzie, vice president, sales
K. C. Colyer, treasurer
Harold H. Spencer Jr., comptroller
H. J. Hofmeister, secretary
C. F. Spencer, assistant secretary

down by Charles Spencer have been perpetuated by his two sons, Kenneth A., president, December, 1942, until his death in February, 1960, and Harold H., chairman of the board since 1953, and by Edwin R. Phelps II, newly elected president, and a highly competent staff of administrative and mine managers (see panel p 74).

Kenneth Spencer's untimely passing in February was a great blow to the company. Associates note that he was "a man of unlimited capabilities and energy."

Backed and encouraged by his father, Mr. Kenneth Spencer's genius took P & M during World War II into the construction and operation of the Jayhawk Ordnance Works. This later became the Spencer Chemical Co., now one of the Nation's leading manufacturers of ammonia, nitrates and other chemical raw materials. The enterprise was inspired by a drive to find new uses and markets for coal.

It was Mr. Kenneth Spencer's genius which again guided the company into purchasing West Kentucky properties in the latter part of 1947. These properties—Colonial, Paradise and DeKoven—currently account for 80% of total production.

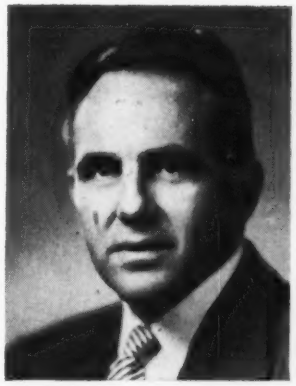
Leadership and Foresight . . .

are supported by long-term utility contracts, and are reflected in greater public acceptance of coal-company stocks. . . . Generally, competitive nuclear power is a long way off, although eventually it may make some inroads in high-cost fuel areas."

Mr. Spencer personally supervises P & M's reclamation and farming activities, which embrace reforestation, cattle-grazing and other farming activities on over 17,000 acres of company-owned land (COAL AGE, September, 1955, p 74). Through such projects the company has shown that worked-out strip lands can become an asset to the community.

Harold H. was born March 5, 1897, in Columbus, Kan. After attending the University of Kansas and serving in the U. S. Navy during World War I, he worked 2 yr for P & M as a salesman. In 1925 he founded a small strip-mining company in Crawford County, Kan., and in 1928 organized the Pioneer Coal Co. to strip mine in Kansas, Missouri and Illinois. He was president of the company from 1928 until 1950 when it was dissolved. From then until now he has given full time to P & M—first as vice president and, since 1953, as board chairman.

In 1948, the Federal Government sent Mr. Spencer to Korea as a member of a group commissioned to study the power situation in that country. He is presently a director of the Pittsburg & Midway Coal Mining Co., the Spencer Chemical Co., and the National Bank of Pittsburg.



EDWIN R. PHELPS II, elected president, Pittsburg & Midway Coal Mining Co., March 9, 1960, would be the first to agree he has "big shoes to fill" in succeeding the late Kenneth A. Spencer. Associates would be quick to add, however, his "fine fund of experience and unlimited energy" render him eminently qualified to take over the job.

During the past 7 yr, as vice president in-charge-of-operations, he has already distinguished himself as the "sparkplug" behind P & M's traditional drive toward more efficient methods and equipment for mining, preparing and marketing coal. One especially outstanding achievement: He was the "chief architect" of DeKoven—the company's newest and most modern mine —also destined to become its largest.

Mr. Phelps was born in Leavenworth, Kan., Jan. 12, 1915. After graduating from the University of Kansas with a B.S. in civil engineering in 1937, he served as engineer and assistant superintendent, Southwestern Illinois Coal Corp., Percy, Ill. In 1942, he began 4½ yr of service as an officer in the Navy Air Corps. Following the war, he worked as construction superintendent for the Constant Construction Co., Lawrence, Kan., until he joined P & M in 1948, serving successively as engineer, superintendent of Mine No. 19, general superintendent, and vice president in charge of operations.

President Phelps is a director of P & M, a director of the National Coal Association, a member of the National Coal Policy Conference, Inc., and chairman, Strip Mining Committee, American Mining Congress. In 1957 he was part of an American team of coal experts sent to offer technical aid to Poland.

He is a member of the Advisory Committee, School of Engineering and Architecture, University of Kansas; the Natural Resources Committee; the U. S. Chamber of Commerce; and the National Society of Professional Engineers.

Other activities include: director, the Mo-Kan Council of Boy Scouts and the Pittsburg United Funds; president, J. L. Hutchinson Little League Baseball Corp.; and, president, the Crestwood Country Club.

Like his predecessor, Mr. Phelps is an enthusiastic plane pilot and saves much time flying to various company properties.

Directors . . .

Frank Barrow, Kansas City, Mo.
John H. Blair Jr., Arcadia, Calif.
Barrett S. Heddens, Kansas City, Mo.
Henry J. Hofmeister, Pittsburg, Kan.
Davis F. McKenzie, Chicago, Ill.
Edwin R. Phelps II, Pittsburg, Kan.
H. H. Spencer, Pittsburg, Kan.
J. G. Spencer, Littleton, Colo.
Dick Woods, Kansas City, Mo.

Operating Officials . . .

R. A. Campbell, Gen. Supt. Strip Mines

Vernon Hendrickson, Gen. Supt. Underground Mines

C. F. Irwin, Chief Engineer

E. H. Citron, Preparation Engineer

Mine Managers . . .

Emil Sandeen, Mine 19
W. D. Humphrey, Pioneer
Joe F. Lake, Osage
James A. Miner, Colonial
O. E. May, Paradise
C. C. Quirey Sr., DeKoven
Ernest Robinson, Russellville

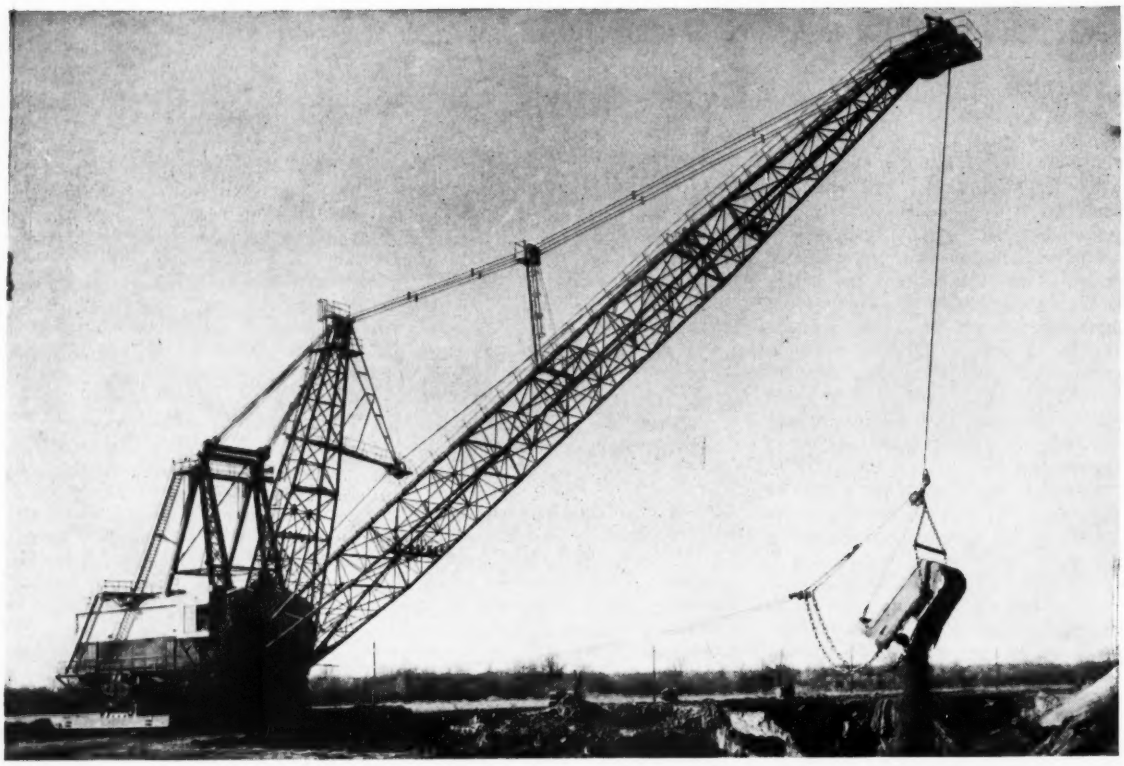
Characteristic of his foresight, DeKoven was acquired some years before use was necessary. The payoff: Since opening August, 1956, the mine's annual capacity has been scaled up to 1,200,000 tons; when No. 6 slope, now under development, is in full production, capacity will be doubled to 2,400,000 tons.

Through a built-in policy of planning for contingencies, P & M had "on tap" a dynamic successor to Kenneth Spencer. With the company 12 yr, President Phelps, in management approach, might have been cast from his predecessor's mold. Associates credit him with "unlimited energy and a fine fund of experience."

During the past 7 yr, as vice president in charge of operation, he has "sparkplugged" the traditional drive toward more efficient techniques and equipment for mining, preparing and marketing coal. Following are highlights of how he and his management associates have implemented this drive at present operations:

W. Kentucky: DeKoven, Paradise, Colonial

DeKoven—Newest property, stressing maximum flexibility in its entire



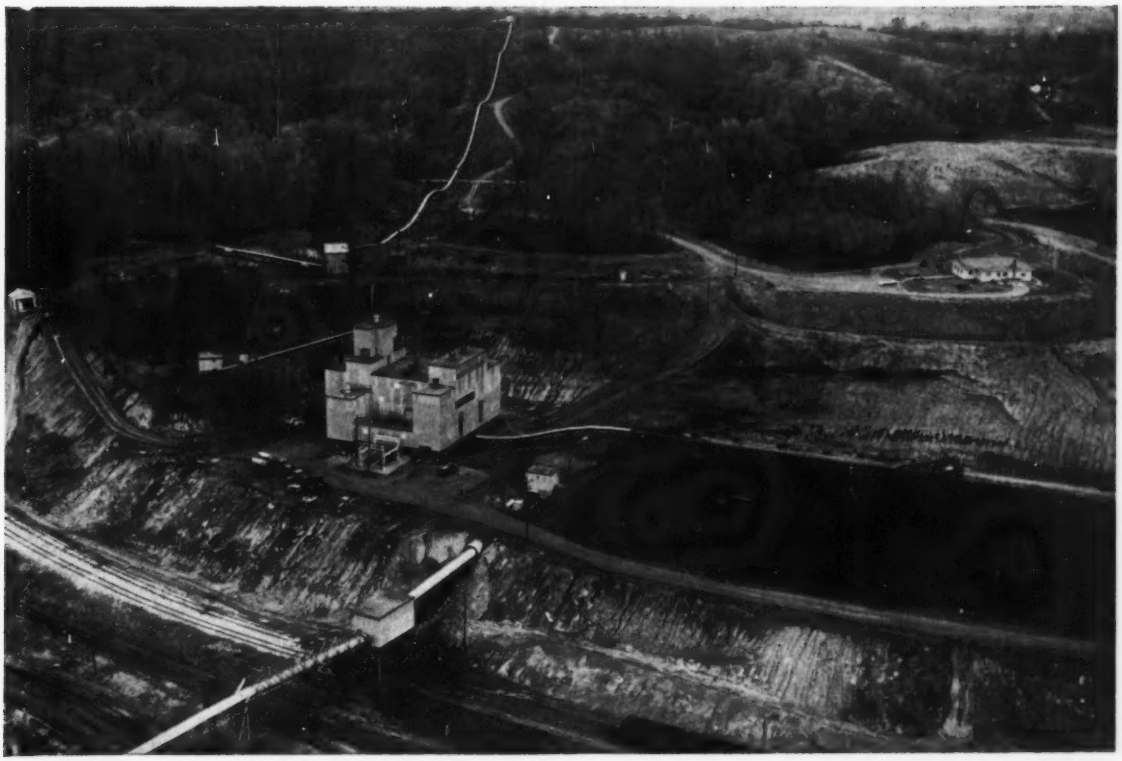
MINE 19: Bucyrus-Erie, 21 cu-yd all-electric dragline, installed in February, 1957 is faster and removes much more overburden than previous 10-yd diesel unit. Other major excavating piece is B-E's 950-B, 33 cu-yd shovel.

COLONIAL cut costs sharply in 1955 by purchasing high-capacity rotary drill and by introducing Akremite for blasting.

operation, is the DeKoven underground mine opened in August, 1956, on the Ohio River at Sturgis, Ky. The property contains coal from Nos. 6 and 9 seams which average, respectively, 48-in and 60-in in thickness, excluding partings. Production so far has been confined to No. 9 seam but a new slope now under development will open the No. 6 seam. When in full production, this seam will boost the mine's annual capacity from 1,200,000 to 2,400,000 tons. Employment is 257, including mine, supervisory and office personnel.

DeKoven features 7,200 V, AC power underground, a 2½ mi overland belt-conveyor system from mine to cleaning plant and from plant to river, a modern river-loading dock,

PARADISE: Key loading unit, a Manitowoc Model 4500 shovel, handled 6,730 tons of coal during a recent 6-hr period.



DEKOVEN stresses flexibility with twin-circuit preparation plant, raw- and clean-coal storage facilities, and a 2½ mi belt system from mine to plant river. Modern loading pier at river can handle 7 empty and 7 loaded barges.

P & M COAL MINING COMPANY

Through a continuing drive for more efficient production methods and equipment, P & M has quadrupled annual output to over 4 million tons during the past 12 yr . . .

MINE 19: Modern preparation plant, processing thin-seam coal with high percentage of refuse, is noted for cleanliness.

OSAGE: A new plant for preparing high-quality coal was built after moving operations from Ill. to Colo. in 1949.

efficient raw- and clean-coal storage facilities, and simplified preparation of a single product (*Coal Age*, June, 1957, p 54).

Through designing for maximum flexibility, minimum downtime for the total operation is achieved. Key factors are raw- and clean-coal storage facilities which permit any of DeKoven's three main elements—mining, cleaning and loading—to operate independently of the others. In the same pattern, the preparation plant is split down the middle with twin circuits, each capable of turning out 500 tph.

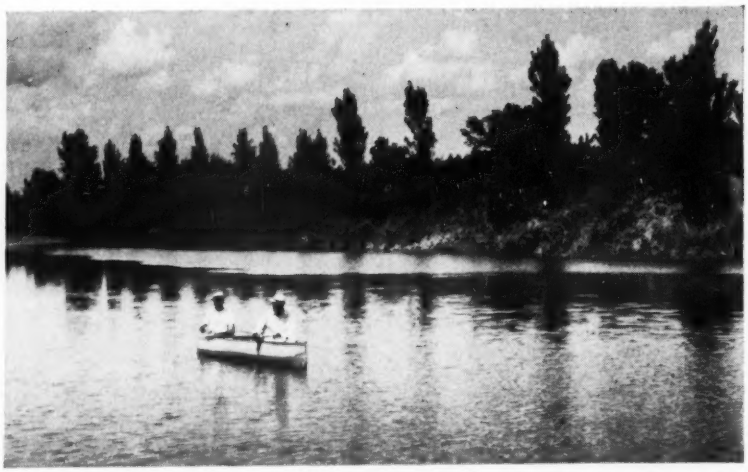
Coal is produced underground by six high-capacity conventional mining units operated by 13-man crews on a 2-shift schedule. One DC unit is maintained as an extra unit. Others are powered from a primary distribution system with a potential of 7,200 V, AC. This is reduced to 480 V at unit substations to insure 440-V face voltage.

Most coal cleaned is shipped as a single product, 3x0, to private utilities and to TVA power stations. Some 1½x0 is prepared for special customers. Virtually all shipments are via river barge, although facilities are available for loading on the Illinois Central R. R.

Paradise – Largest operation and keyed to multiple-seam mining is the Paradise strip mine, started in February, 1953, at Drakesboro, Ky. Annual output in 1956—980,000 tons—has been nearly doubled to the current rate of 1,800,000 tons. Employment totals 137.

Running through the property are seams No. 9, 11, 12 and 13, with average thicknesses ranging from 42 to 72 in, excluding partings. Maximum overburden removal is 145 ft; the average, 90 ft. Removal of deep overburden is justified economically by simultaneous mining of the Nos. 13, 12 and 11 seams, whose average thicknesses total 186 in.

Three-stage mining includes (1) drilling and blasting for each seam separately, (2) removal of light cover from top seam, No. 13, with a 21-cu yd Bucyrus-Erie 750-B shovel, and (3) removal of remaining overburden, in sequence, from Seams 13, 12 and 11 with a 21-cu yd Bucyrus-Erie 770-B dragline. Conventional loading and hauling equipment is used. Scheduled to replace some small tonnage trucks about April 1 were two 90-ton Le Tourneau-Westinghouse Model 80 Haulpak bottom-dump coal haulers.



RECLAIMED strip pits are popular for fishing and water-skiing. All company lands not yet mined or worked-out are put to agricultural or recreational use.

Paradise also features a McNally-Pittsburg cleaning plant with capacity of 650 tph; a 53,000-ton washed-coal storage area adjacent to the plant; and a 7,180-ft plant-to-river, two-section belt system installed in May, 1958. The belt system replaces previous truck haulage and has made it possible to increase the volume of river shipments from 1,200 to 5,000 tons per day. Maintenance note: Belts are turned 180 deg at each transfer point to avoid spillage and build-up of fine wet material on idlers and pulleys.

Coal is shipped to utility and general industrial markets by river barge and by rail on the Louisville & Nashville R. R. Among its equipment, P & M counts one 148-ft diesel towboat, six 750-ton steel coal barges and three dock barges.

Colonial—P & M's oldest Kentucky property, the Colonial strip mine, opened May, 1947, at Madisonville, Hopkins County, is still going strong. Annual output has been moved up quite sharply in recent years from 607,000 tons in 1958 to the current rate of 900,000 tons. The latest personnel count is 100.

Reserves encompass coal from Seams No. 9, 11, and 12, whose average thicknesses are, respectively, 60, 72 and 48 in, excluding partings. Average overburden is 80 ft. Depending on the digging ratio, Seams 11 and 12 are strip-mined simultaneously or separately. When it becomes uneconomical to mine these two seams, plans call for deep mining No. 9 seam.

Achievements in low-cost strip mining have distinguished Colonial's operations. Especially notable was the year 1954 which saw (1) introduction of Akremite for blasting, and (2) purchase of a Bucyrus-Erie 50R, high-capacity rotary dry-type overburden drill. Akremite brought a 40 to 60% saving over the cost of conventional explosives. Its use, along with the new large-hole drill, resulted in better fragmentation and an increase of 90 cu yd per hr in the stripping rate (*Coal Age*, July, 1955, p 56).

The drive for greater efficiencies also has stressed aggressive maintenance. Time-saving innovations have included installation of radio communications between shop and key field-operating units; mobile trucks for field repair; and a weatherproofed track-mounted shop facility for repairing buckets in bad weather.

Preparation-plant capacity is 550 tph. Because of differences in quality, Nos. 11 and 12 coals are separately prepared. In each case, raw product is split into 6x1½ and 1½x0 sizes for separate washing. All coal is shipped via rail, primarily to utility markets with some going to Canadian railroads.

W. of the Miss: Mine 19, Pioneer, Russellville, Osage

Mine No. 19 – Since September, 1951, management at Mine No. 19, Hallowell, Kan., has successfully met

NEW HEADQUARTERS building, Pittsburg, Kan., is P & M nerve center. Building is equipped with heat pump installation for year-round air conditioning.

Operations in Brief . . .

	Pioneer	Russellville	Osage
Date started	1950	June, 1957	Nov., 1949
Seams	Tebo & Upper Weir-Pittsburg	Hartshorn	Wadge
Avge. thickness (exc. part.), in.	23	20	96
Avge. overburden, ft.	35	40	55
Annual prod., tons	260,000	70,000	170,000
Plant cap., tph	300	(1)	350
Total employment	52	21	34

(1) Preparation facilities include single-roll crusher and loading conveyor.

the challenge of profitably mining the Mineral and Fleming seams where the ratio has sometimes run as high as 40 to 1. Seam thicknesses, excluding partings, average 18 in; overburden, 35 ft. Although initial estimates put the mine's life expectancy at 8 to 10 yr, P & M feels that there should be at least that much more time ahead for profitable operations. Current annual production is 450,000 tons. Personnel doing the job totals 98.

Profitable operations have been pegged to careful removal of overburden with machines and methods especially adapted to thin-seam strip mining (*Coal Age*, November, 1954, p 81). Depending on the digging ratio, the Mineral and Fleming seams are stripped simultaneously or separately. Key equipment units for excavating, loading and hauling are the following:

1 Bucyrus-Erie 950-B shovel, 33 cu yd
1 Bucyrus-Erie 770-B dragline, 21 cu yd
1 Bucyrus-Erie 85-B loader, electric, 4 cu yd, horizontal thrust
2 Caterpillar D-9 tractors, with rippers
1 Bucyrus-Erie 38-B loader, diesel, 2½ cu yd
9 40-ton Dart trucks

Recent purchases to increase efficiency and reduce costs are the Caterpillar D-9 tractors listed, which replaced pinning and shooting machines for loading (May, 1957), and the 770-B dragline, which replaced a smaller-capacity diesel model (February, 1957). For the same reasons, torque-converter units have been added to two Dart trucks, one of which is used for haulage, one for refuse.

Maximum size of coal prepared is 6 in. Most shipments are via rail, principally to utility markets, from a McNally-Pittsburg preparation plant with a capacity of 550 tph. In some cases, savings in handling costs have been realized by using trucks to haul coal from the plant to the customer's stockpile (*Coal Age*, November, 1954, p 85). Management at Mine No. 19 maintains radio contact with the M.K. & T. R.R. depot (W. Mineral, Kan.), with key field-operating units and with P & M's main office at Pittsburg.

Pioneer, Russellville, Osage—P & M operates three other strip mines west of the Mississippi River—Pioneer at Appleton City, Mo.; Russellville at Russellville, Ark.; and Osage at Steamboat Springs, Colo. Basic data on each is shown in the accompanying table.

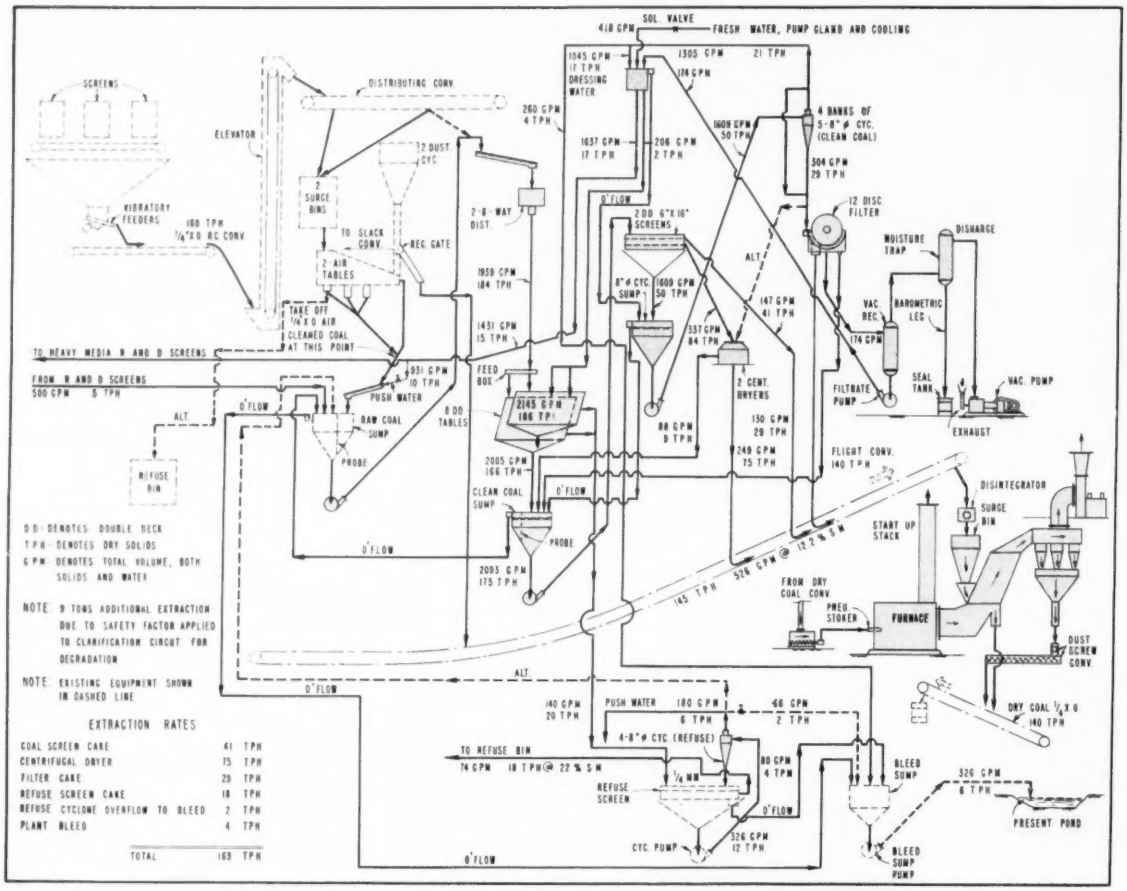
Pioneer's stripping has so far been confined to the Tebo seam with the Upper Weir-Pittsburg seam held as a standby where workings might be opened if justified by market demands. Shipments are via rail to utilities.

Russellville strips "semi-anthracite." The product is so defined by *Keystone Coal Buyers Manual* (1957 ed., p 329) because "it is harder in physical structure and lower in volatile matter" than other coals mined in the Hartshorn seam. Volatile matter runs 9.8 to 11.9%; fixed carbon, from 75.2 to 80.5%. The coal is shipped to firms in the southwest for smelting zinc and lead (primarily zinc).

Flexibility of operations at Osage, plus use of the latest and most efficient types of excavating and loading equipment, have made it one of the most modern strip mines in the Colorado field. Equipment and plant for the mine were moved April 1, 1949, from LaSalle County, Ill. In the process, much of the equipment was overhauled and a completely new tipple for handling high-quality coal was constructed (*Coal Age*, November, 1950, p 82).

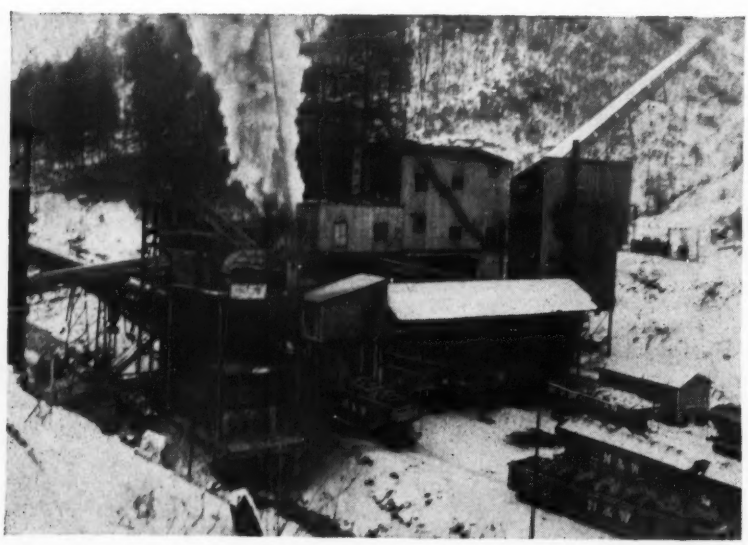
Of necessity, Osage has had to adapt its total operation to mountainous terrain and severe winter conditions. Sites are prepared with heavy-duty Caterpillar tractor-dozers. In a seam which pitches as much as 10 deg and has as much as 90 ft of overburden, stripping is done by vertical drilling and shooting, and by using a dragline equipped with a 160-ft boom and a 10 cu yd bucket.

A modern preparation plant features primary and secondary crushing below the receiving hopper; an especially designed mechanical-shutter conveyor for fast, efficient loading of closed cars; and three steel truck-bins for handling custom coal. A variety of sizes are prepared from 16x8 to 1x1¼. Coal is shipped to utility and domestic markets via rail.



FLOW DIAGRAM shows coarse- and fine-coal cleaning and water-clarification system.

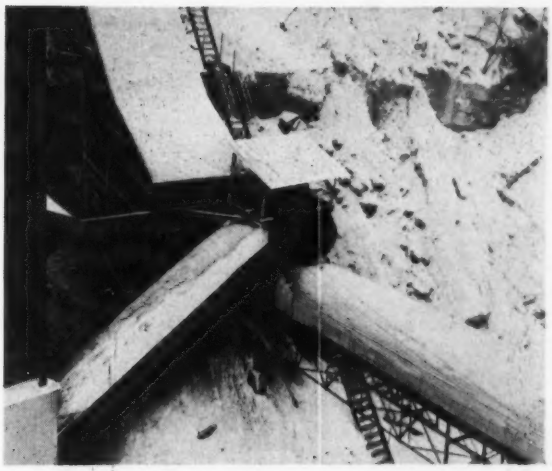
Meeting the Challenge in Preparation



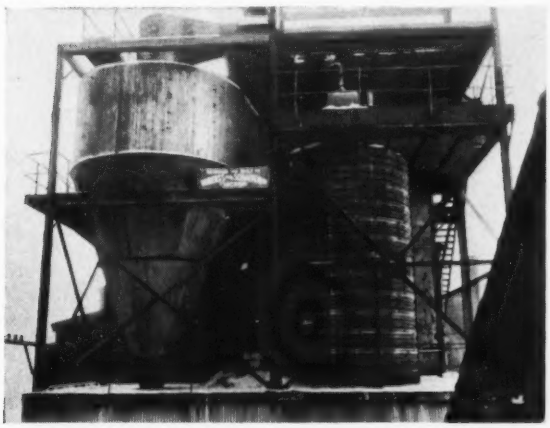
How Jewell Ridge Coal Corp. has consistently improved the quality of its coal by updating plant facilities as new and better equipment becomes available.

DESIGNED TO PRODUCE QUALITY PRODUCTS Jewell Ridge's No. 2 plant features the latest equipment for cleaning coarse and fine coal, including heavy-medium washer, dry and wet tables, cyclones, and centrifugal and heat dryers.

CONVEYORS in truck-storage bin transfer coal to far side of bin, making it possible to load bin to full capacity.



COAL FROM STORAGE BIN is conveyed to plant by belt conveyor. Chain conveyor from bin discharges onto belt.



DUST CYCLONES dedust fine coal at air tables. Two 35-ton surge bins (right) add flexibility to process.

COARSE-COAL DEWATERING AND SIZING are accomplished by vibrating screens at head of cleaning circuit.

KEEPING PACE with modern preparation developments and new technology has paid off at the No. 2 plant of Jewell Ridge Coal Corp., Jewell Valley, Va. Plant improvements have made it possible to produce quality products containing a maximum of 4.40% ash and 3% moisture, with a minimum Btu of 15,000.

Jewell Ridge's quick response to the changing nature of coal preparation is aimed at keeping ahead of the changing market picture. As new and better equipment becomes available the company either adds to existing facilities or replaces old equipment. The No. 2 plant has undergone four major changes, plus numerous others, in the past several years. Starting with calcium-chloride washers it went to air tables, then to a heavy-medium plant and finally to the modern coarse and fine-coal cleaning plant that is the heart of operations today.

Belknap calcium-chloride washers were installed in the late '40s and early '50s. Roberts & Schaefer Super Air Flow cleaners were added in 1956. In 1957, a 400-tph 12x12 heavy-medium Wemco Mobil-Mill, Concenco distributor, two No. 77 diagonal twin-deck Deister tables, CMI dryer, filter and dewatering screens, and eight Heyl & Patterson cyclones were installed to keep pace with consumer's demands for quality products. The final stage of the improvement program was completed in 1959 with the addition of a Heyl & Patterson fluid-bed dryer and 20 cyclones, CMI dryer, six No. 77 diagonal twin-deck tables, a 10-ft 6-in 12-disc Eimco filter, two filter screens and a revolving feed distributor.

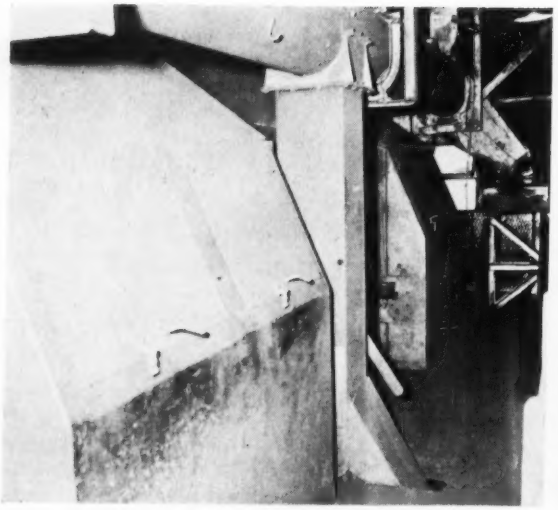
At full capacity the fine coal plant will clean and load 3,350 tons of clean coal per day, three shifts. Capacity of the fine-coal plant is 160 tph but can be increased to 186 tph by making a few minor changes.

Run-of-mine feed is 320 tph.

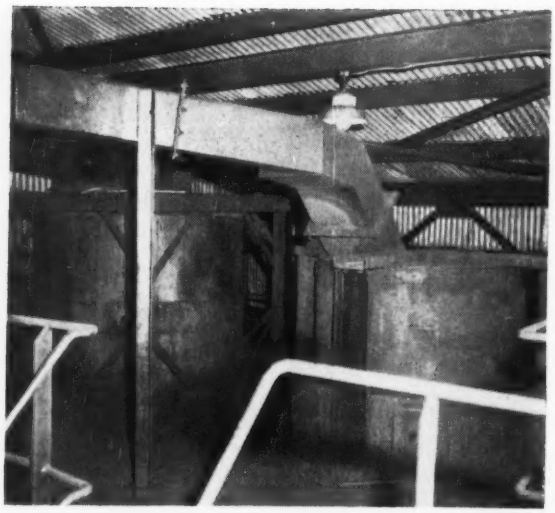
Coarse-Coal Processing

Jewell Ridge prepares coal from the 38-in Jewell seam. Coal is received at the plant from Mine No. 2 by belt conveyor and also from mines in outlying areas by trucks which dump into a 2,000 ton storage bin.

Raw coal from both sources is conveyed to a common chute which discharges onto a shaker screen. An 8x0 product is fed onto a conveyor which discharges onto three 6x16 Allis-Chalmers vibrating screens. Plus 8-in—ap-

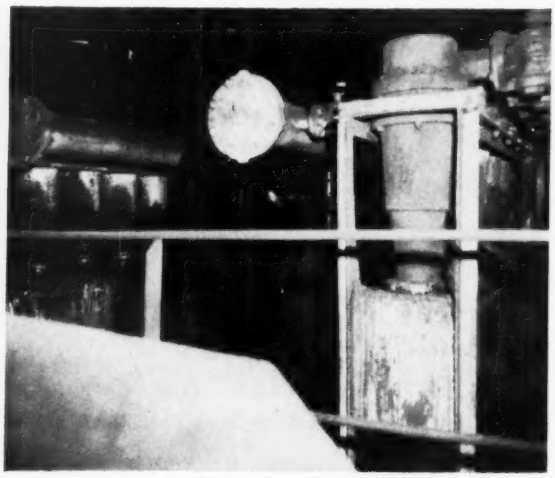


AIR TABLES dedust ¼x0 product from surge bins. Dust is collected in cyclone collectors and fed to slack conveyor.

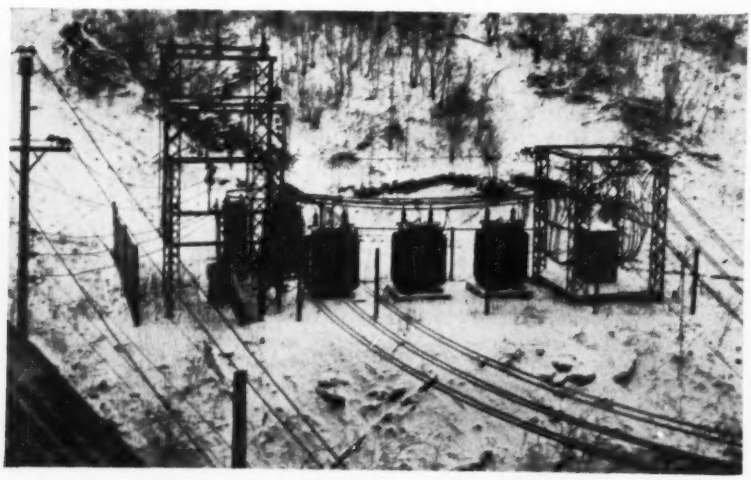


PRODUCT FROM RAW-COAL SUMP is pumped to two eight-way distributors which serve eight double-deck wet tables.

THE ⅛ IN X ½ MM PRODUCT from the dewatering screens is mechanically dried in two centrifugal dryers.



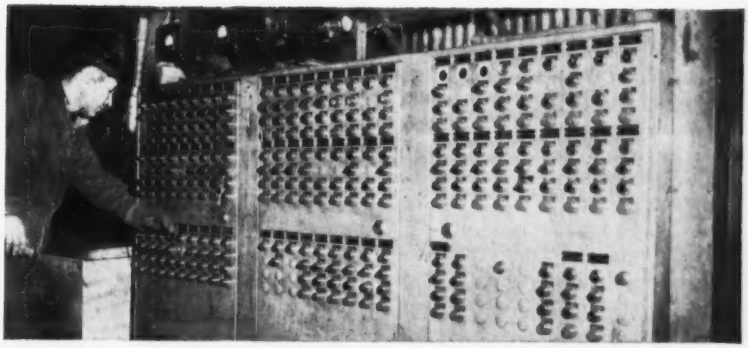
FOUR BANKS OF 8-IN CYCLONES are used to clarify water in the fine-coal plant. Cyclone underflow may be dried.



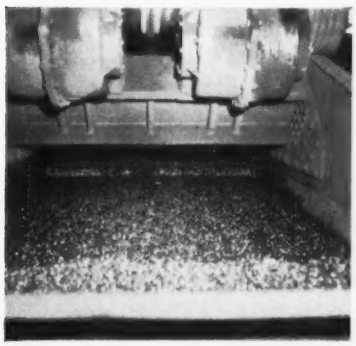
TWO TRANSFORMER BANKS supply power to plant. Primary is 13.2 kv, secondary 440 V. The drying plant uses a 2.3 kv 600-hp motor. Power factor averages 98%.

CIRCUIT BREAKERS with automatic pushbuttons are housed in separate room.

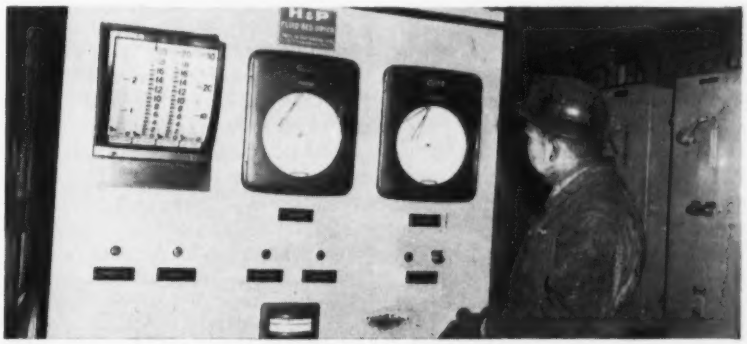
CLEANED ¼x0 COAL is collected in the clean-coal sump and then pumped to two 6x16 dewatering screens ahead of dryers.



THE ENTIRE PLANT is controlled by one man stationed at the heavy-medium washer. Controls are located in the coarse coal plant next to the washer. Electrically interlocked controls feature sequence starting and stopping.



DEWATERING SCREENS separate ¼x⅛ product for heat drying. Remainder goes to centrifugal dryers, cyclone sump.



MOISTURE OF THE ¼x0 PRODUCT is controlled by drying-plant operator. Dryer performance is recorded in charts to provide permanent data. Final stage of the interlocked controls feature sequence starting and stopping.

proximately 30 tph—is crushed to minus 8-in and united with the 8x0. Plus 8-in also can be loaded directly into railroad cars.

A ¼x0 product made on the three vibrators is collected on a raw-carbon conveyor which discharges into two 35-ton surge bins. Plus ¼-in is conveyed to a 6x16-Allis-Chalmers Low Head vibrator for a 3/16x0 separation. This product is pumped to a collecting sump in the fine-coal plant. Top product (8x3/16) goes to the 12x12 heavy-medium drum.

Clean coal from the heavy-medium drum is discharged onto a 5x16 double-deck Low Head vibrator. Top 8x3½-in product goes to a loading boom for direct loading or is conveyed to a Gundlach crusher and then loaded. The bottom product (3½x3/16) is conveyed to a secondary shaker screen for further classifying. The 3½x¾-in size can be loaded directly or crushed. The 1¾x¾ can be loaded into cars, crushed or discharged onto the slack conveyor. The remainder ¾x¼ on the secondary shaker can go to the slack conveyor, the pea-and-

PLANT PERFORMANCE is checked by Joe Skiba, division superintendent, and John Shortridge, superintendent.

slack conveyor, or can be loaded separately.

Tailings from the 5x16 vibrator go to a wash sump and medium sump.

Refuse from the heavy-medium drum is sluiced to a 3x16 Allis-Chalmers vibrator. Top product (refuse) is discharged to a refuse conveyor for disposal by trucks. Tailings go to the wash sump and heavy medium sump.

Tailings, consisting of water, ¼x0 and mesh material from the medium sump are returned to the heavy-medium drum. Tailings from the wash sump are pumped to a magnetic separator. Magnitite goes to a densifier where mesh material is separated and then sluiced to the medium sump. Water is returned to the wash sump. The remainder (water and ¼x0) from the magnetic separator is pumped to a tailings sump. Tailings are then pumped to the 6x16 vibrator which makes the 3/16-in separation and also to the 3x16 refuse vibrator.

Fine-Coal Processing

The ¼x4 product made on the three 6x16 vibrators and the 3/16x0 product from the secondary 6x16 vibrator in the coarse-coal circuit go to the fine-coal plant. The ¼x0 is conveyed to two 35-ton surge bins and the 3/16x0 is pumped to a collecting or raw-coal sump.

The carbon product (¼x0) is fed onto a 160-tph conveyor by vibratory feeders. The carbon conveyor dis-

charges into an elevator which in turn discharges onto a distributing conveyor. This product can be stored in surge bins or sluiced to distributors.

Carbon from the surge bins goes to the two air tables. Material collected at the first draw can go to the refuse bin or can be united with material from the second and third draws.

Product from air tables, push water from a dressing-water tank, material from refuse and dewatering screens in the coarse-coal plant, overflow from clean-coal sump and overflow from refuse cyclones are collected in the raw-coal sump. This material is pumped to a feed-table sluice which discharges into the two eight-way distributors which distribute to eight double-deck wet tables.

Refuse from the tables goes to a ¼-mm refuse screen. Top product goes to the refuse bin and bottom product to four 8-in cyclones.

Overflow from cyclones can go to the raw-coal sump, bleed sump or it may be recirculated to the refuse screen. Underflow discharges onto the ¼-mm screen. Overflow from refuse screens goes to the bleed sump.

Clean coal from the wet tables goes to a clean-coal sump and then is pumped to two 6x16 double-deck dewatering screens. Top product is conveyed to the drying plant and bottom product goes to two centrifugal dryers. Underflow discharges into a cyclones sump and then is pumped to four banks of five 8-in cyclones. Cyclone-sump overflow is returned to the clean-coal sump.

Overflow from the cyclones goes to the dressing-water tank, bleed sump or the 12-disc filter. Underflow can be pumped to the centrifugal dryers as an alternate.

Product from the centrifugal dryers is conveyed to the fluid-bed dryers. Effluent is returned to the clean-coal pump.

Filter cake from the 12-disc filter goes to the drying plant. The filtrate is pumped to a vacuum receiver and then to the dressing-water tank. Overflow from the filter is returned to the clean-coal sump.

Products from the centrifugal dryers, dewatering screens and filters are collected on a clean-coal conveyor which discharges into the dryer surge bin. Dried coal is loaded into cars.

Fresh Water Supply—Water is supplied by a mountain stream next to the plant. Jewell Ridge has constructed one dam with a capacity of 5¾ million gallons of water and also has installed a 30,000-gal tank to insure a continuous supply of water during dry seasons. The elevation of the dam is well above the plant and the tank. Thus water does not need to be pumped to the plant. It flows by gravity through a 5-in pipeline. Water supplied to the tank also is by gravity flow, and also can be pumped from the stream through a 4-in pipeline.

Fresh water is pumped to the dressing-water tank in the plant. Water also is collected from the vacuum receiver and the clean-coal cyclones. This tank supplies water to the raw-coal sump and the heavy-medium refuse and dewatering screens, wet tables and the cyclone feed sump.

Overflow from the raw-coal sump, ¼-mm refuse screens and refuse cyclones, plus water from clean-coal cyclones is collected in the bleed sump and then pumped.

Quality Control—Carefully worked out inspection and quality-control programs are in effect at the Jewell Ridge operation. The programs include visual inspection as well as control of the washers and evaluation of the quality of coal produced and loaded.

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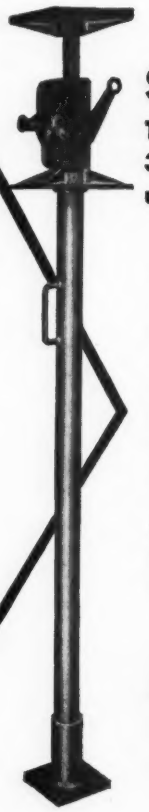
- Sizes for all seam heights available



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Place a Jack alongside each of the first row of bolts closest to the face. Raise to the roof to provide temporary support. Remove bolts by hand or pneumatic wrench. Stand 25' or more away and pull on a rope attached to the Jack trip lever which collapses the Jack. Move Jack to position under the next row of bolts and proceed as previously.

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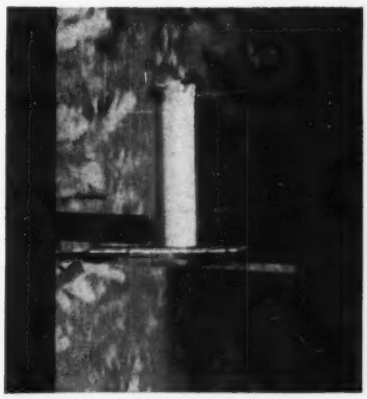
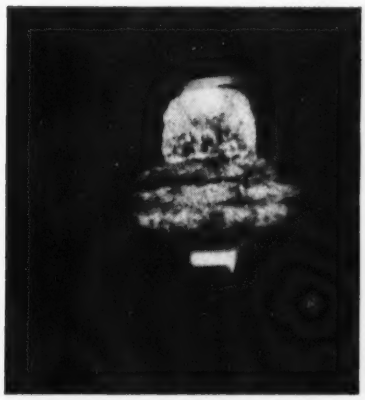
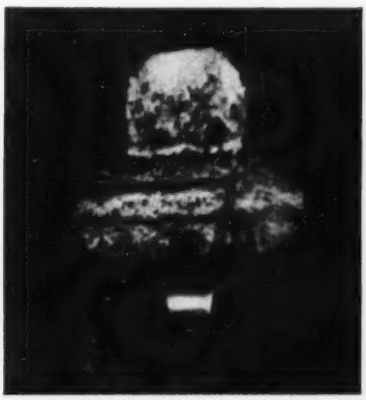


2:13 P.M. The 13"-long charge, containing 94% Spencer N-IV Ammonium Nitrate and 6% fuel oil is about to be detonated.

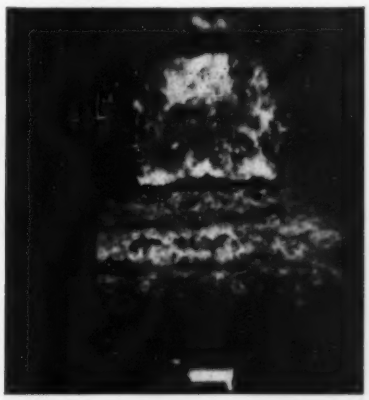
2:13.000028 P.M. The detonation wave has already spread over nearly one-third of the Spencer N-IV—fuel oil mixture.



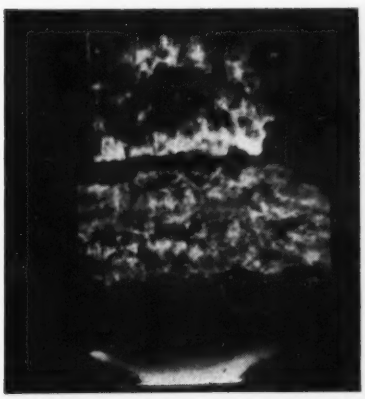
2:13.000056 P.M. This mighty, but controllable, energy is partly a result of N-IV's special structure and greater nitrogen content.



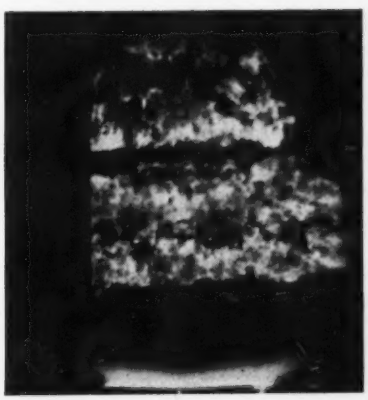
2:13.000088 P.M. Shown here is the great detonation velocity of the N-IV—fuel oil mixture. Yet, N-IV is safe to store and handle.



2:13.000128 P.M. The continuous and even release of energy shown here is a result of extensive Spencer research.



2:13.000160 P.M. Near maximum energy is now being released by the low-cost Spencer N-IV Ammonium Nitrate—fuel oil mixture.



2:13.000184 P.M. Full detonation! For information on how you can use Spencer N-IV Ammonium Nitrate, fill out, mail coupon at right.

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15,057,400 yards of overburden removed

with five USS Tiger Brand hoist ropes

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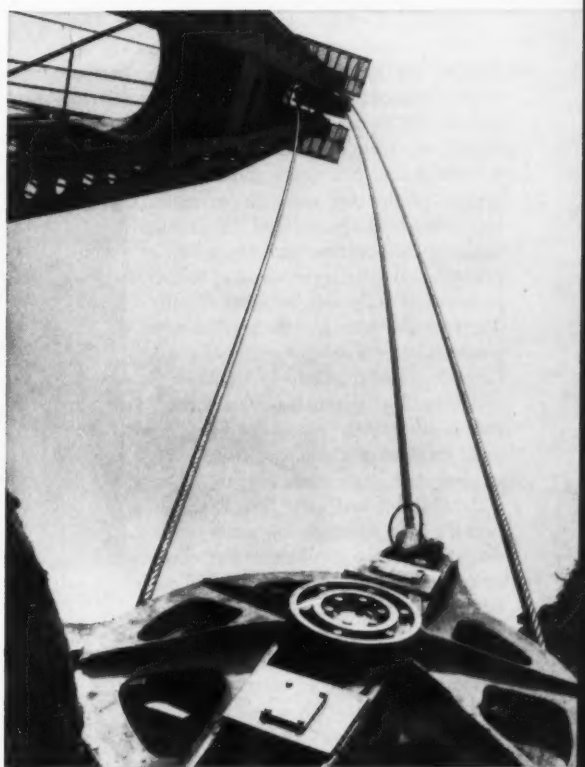

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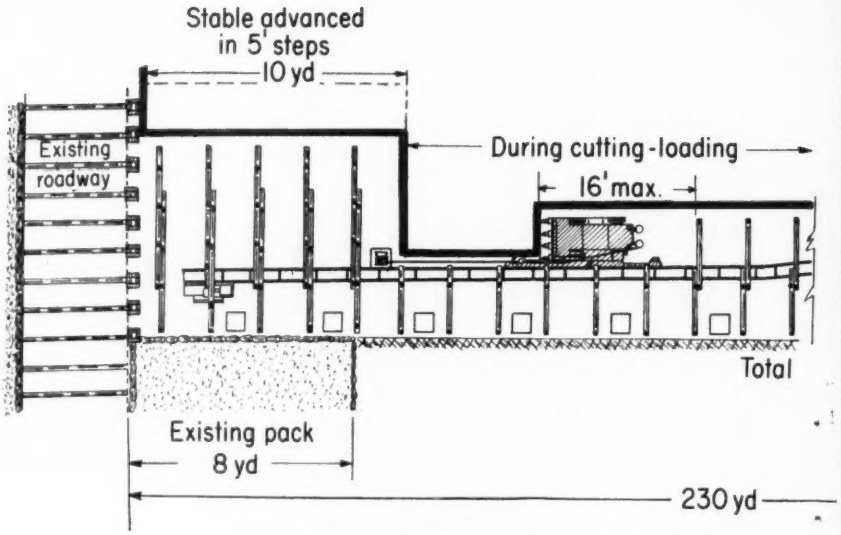
Mechanized Longwall

How a Russian cutter-loader is used on faces 600 ft or more long at state-owned mines in the Kingdom of Morocco; what its future prospects are in coal 2 ft or less thick.

Dr. Ing. Karl Hartland, Fuengirola, Spain, consulting engineer to the Moroccan Ministry of Power.



LAYOUT AND OPERATION of a 230-yd-

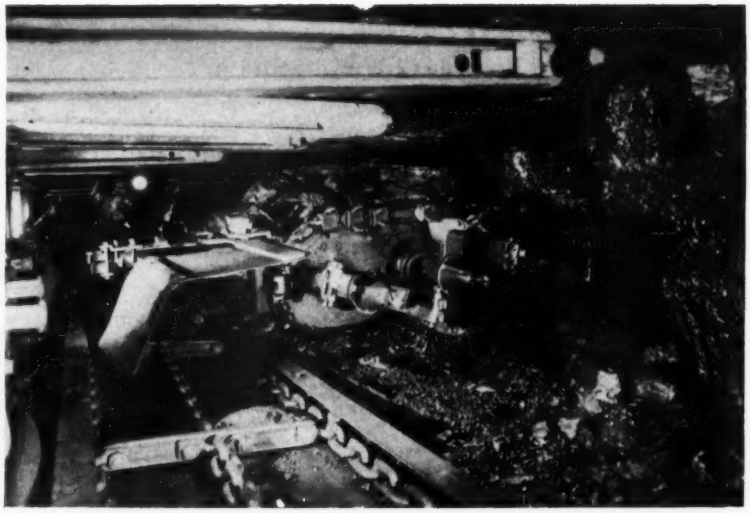
THE RUSSIAN UKT-3 cutter-loader was introduced into Morocco at the end of 1956 as an experimental machine on thin-anthracite longwall faces and can now be regarded as a proved production unit. Since multi-jib cutter-loaders, as well as flight-loading coal-cutting machines, had provided no satisfactory answer to the problem of fully mechanizing 1½- to 2½-ft coal there was a need for a power-loading machine possessing the following characteristics:

1. Capable of simultaneous cutting and loading.
2. Producing a good percentage of graded and large coal.
3. Able to work on a broad face to provide the tonnage necessary for economic working in view of the restrictions on movement of attendant labor in thin seams.
4. Involving a low capital outlay.

The Russian UKT-3 having been designed especially on these lines and proved under Russian conditions, the Soviets were eager to offer it and it could easily be adapted to Moroccan conditions by some minor modifications.

Machine Characteristics

1. The UKT-3 consists of a standard coal cutter from which the cutting end is removed and replaced by

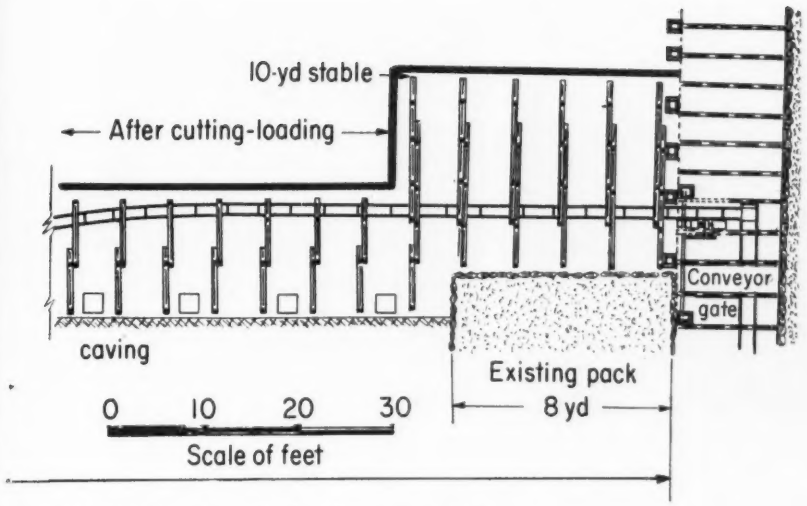


CUTTER-LOADER in action. Boring heads move coal sideways to the conveyor.

TABLE I—Performance Data, UKT Miner

	Average	Minimum	Maximum	Optimum*
Tons of raw coal per shift	230	..	..	260
No. of men on crew	13	11	15	5
No. of tons of raw coal per man-shift	17.7	15.5	20.9	52
Percentage of downtime due to mechanical and electrical delays	10.3	8.3	12.4	10
Percentage reduction in face labor achieved by UKT miner compared to conventional longwall mechanization	32	28	34	42
Percentage reduction in face labor achieved by UKT miner compared to conventional shotfiring and handloading	67.5	62	73	86

*Hypothetical figures for fully mechanized man-free faces.



long face using the Russian cutter-loader.

OWNED BY THE STATE, the mining properties using the cutter-loader are at El-Azir and Benabha.

In Morocco

a cutting-and-loading head having four boring arms enclosed in a peripheral frame jib.

2. Three rotating boring arms 72 deg out of phase one to the next provide a cutting width of approximately 5 ft, passing the coal to the outer arm which loads it on a self-advancing armored flexible conveyor.

3. The cutting head is supplemented by an additional peripheral side-cutting chain adjustable to the height of the seam. It completes extraction and, by means of four double-flight boxes, assists in coal loading.

4. A 1,450-rpm motor shaft, operating through a three-stage gearbox, rotates the boring arms at 95 rpm and operates the trimming chain at 370 fpm.

5. If desired the speed of the chain and boring arms can be changed by incorporating changing gears in the second stage of the gear box.

6. The machine can be operated at up to 30 in per min steady rate without exceeding its maximum power rating of 78 hp.

7. The machine is mounted on continuous skids, with vertical steering control originally through two roof and two floor hydraulic jacks, using the gear-box oil as the hydraulic medium.

8. Horizontal steering is effected by the guide-bar principle.

9. Continuous haulage is accomplished by a capstan drum with a maximum tractive effort of 8 tons.

10. The machine provides a clean-up comparable to all other conventional units.

Operation, Roof Support

The machine generally is power-loading 210 yd out of 230-yd faces in a seam approximately 2 ft thick. Since it is single-ended, 10-yd stables are provided at each end of the face in which the machine is turned. Through study and practice turning time has been reduced from 100 to 60 min, thus leaving 6 hr out of 7 hr overall working time available for cutting. Percentage of down time due to mechanical and electrical delays ranges between 8.3 and 12.4%; thus 210 yd can easily be cut in one shift at an average machine speed of 24 in per min.

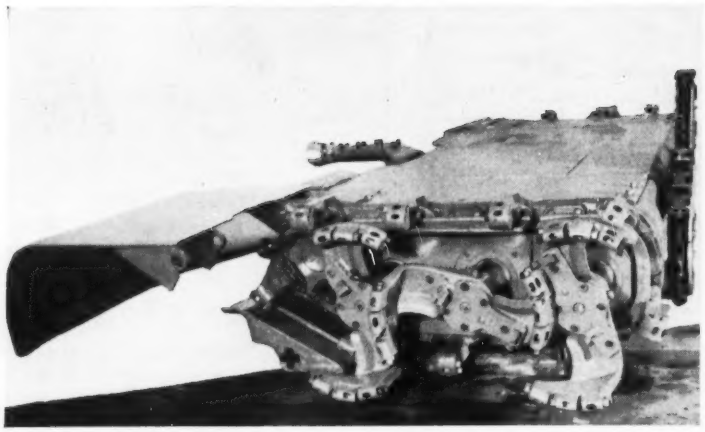
The complete caving system is employed between the 8-yd gate-side packs at each end of the long-wall face. Roof support is supplied at 6-ft intervals by mechanized props aided by hydraulic "Go-far" chocks having a range of 1 ft 6 in to 2 ft 2 in in conjunction with 6-ftx½-in W-section steel bars. Hydraulic props also are used in the stables, the steel bars being 16 ft long. Where required, temporary wood or metal props are set behind the machine

TABLE II—Cost Data

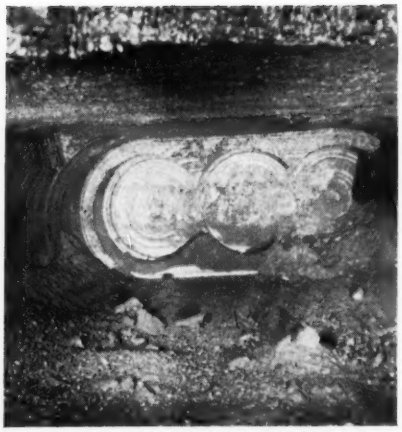
	Average	Minimum	Maximum
Labor cost per ton of raw coal	0.61	0.52	0.70
Power cost per ton of raw coal	0.008	0.007	0.009
Maintenance costs, spare parts per ton of raw coal	0.10	0.04	0.15
Bit cost per ton of raw coal	0.03	0.01	0.06

TABLE III—Sizing Tests, Coal Produced by Various Methods of Mining

	Shot and hand loaded, 2½-ft seam	Multijib cutter-loader, 2½-ft seam	UKT miner, 2-ft seam
−6 in	11.13	0.87	1.10
6x4	11.07	1.93	2.90
4x2	13.34	5.84	7.97
2x1	20.36	12.13	14.83
1x½	18.21	18.60	25.79
½x⅛	16.76	27.43	27.98
⅛x0	9.13	33.20	19.43
Total	100.00	100.00	100.00



THREE BORING HEADS and a solid-side trimming chain are the coal-producing elements of the cutter-loader employed in thin-coal Moroccan mines.



FACE-CUTTING PATTERN—conveyor side at right, solid side at left.

when cutting. This, however, is seldom necessary.

Manpower, Face Organization

In gathering data for this article it soon became apparent that it was rather difficult to set out average figures for manpower employed, as the number of operators had hardly ever been constant for more than a short period. Consequently, methods studies were employed to assess correct work loads for the various operations to establish the correct manpower as shown in Table I.

The machine operator is aided by an assistant for cleaning up, occasional timbering, etc. A team of two men is needed for adjusting prop setting and convyer push-over. Waste work, advancing of support and assisting gate-side packing asks for another four men. Four operators work in the stable and at the gate-side packing, one shift-fitter looks after the conveyor and power-loader and the other machines. Thus 13 men work on each of the two cutting shifts, plus two men for maintenance work to be carried out on the night shift, resulting in a total of 28 manshifts for a daily output of some 460 tons or more.

Costs and Performance

To show the situation as clearly as possible, the performance and cost data in the Tables I and II have been divided into average, maximum and minimum figures, according to differing results obtained under varying conditions over more than 2 yr, excluding about 2 mo for men and officials to acclimatize themselves to the new machine and the working conditions.

Methods studies on "delays" and cutting speed, as well as assessment of the work loads for the various operations associated with the miner, permitted fixing the best face length at 230 yd, optimum cutting speed at 24 in per min and crew size at 13 men. Thus 28 manshifts are required for producing 460 tons of raw coal per shift, a very remarkable performance in thin-seam mechanization in general and especially in hard anthracite mining. With this productivity of 16.4 tons O.M.S., wage costs per ton have gone down more than 65% compared to conventional longwall mining (undercut or shot and hand loaded) and also substantially in comparison with multijib cutter-loading and flight loading.

Product Size

Sizing tests were made on coal produced by the UKT-3 loader, coal won by conventional working (shot and hand loaded) and coal won by a multijib cutter-loader working in the same or comparable seams. The results are shown in Table III. The UKT-3 produces 3.33% more coal above 2 in than the multijib cutter-loader, though 23.57% less than with conventional working. These sizing tests were carried out by taking samples from the gate conveyor. Therefore such tests are not truly indicative of the ultimate product sizing at the preparation plant. It is generally known that hair breaks in the coal as a consequence of shooting contribute to a greater degree of degradation in handling than is the case with mechanically produced coal.

Machine Modifications

To adapt the UKT-3 cutter-loader to different working conditions, in the light of practice and experiments, the following chief modifications have been carried out:

1. The cutting head, originally fitted with boring heads with five heavy-section cutter bits with a central pilot bit, tended to result in recirculation of the coal. It therefore was fitted with modified trepanner heads of the type used on the British Midget Miner.

2. The hydraulic jacking system was altered by eliminating the two roof jacks and adding to the two floor jacks. The hydraulic system also was made completely self-contained and independent from the gear box, reducing the operating pressure from 4,000 to 1,500 lb per sq in.

3. Horizontal steering using a long guide bar was not satisfactory. After some unsuccessful trials a medium-length guide bar, fixed to the cutting head of the machine and rolling along the conveyor, was adopted.

Future Development

Since fully mechanized man-free faces and thin-seam machines have been attained in only a few instances it appears that further development of the UKT-3 cutter-loader and modifications is definitely worthwhile, in spite of the problems involved in taking a wide slice. But slices as wide

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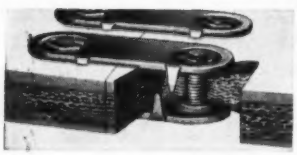

Cutaway of a Flexco application showing the compression plates, teeth and precision-made bolts and nuts.

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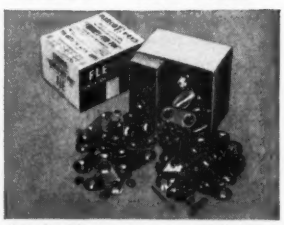

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Longwall *(Continued)*

as 5 ft 4 in may, indeed, be considered highly necessary if thin-seam working is to complete with mechanized extraction in the thicker seams. Naturally the aim of such future development work should be high outputs from fully automated systems. Future development of the UKT 3 coal-cutter loader therefore should include study of the following:

1 — Turnaround Time — Since the turnaround time of the machine is now at least 60 min, this loss of productive machine time cuts output about 15% or 40 tons in a 2-ft seam. This turnaround time must be eliminated. A double-ended machine, like the German Korfmann developed for thicker seams, might offer the best solution. In addition to reducing turnaround time it would save several yards of stable-hewing, with consequent reduction in labor requirements.

2—Steering—Automatic steering of the miner is essential for the development of fully mechanized man-free faces. Achievement of this goal requires automatic sensing equipment capable of differentiating between coal and floor dirt. The accuracy of steering should be between 1 and 2 in. The solution probably will be an electronic steering device along the lines of that now being developed by the British National Coal Board. The hydraulic jacks might also be operated by the same means. Such a perfected steering device could permit operation with only a simple pushbutton station on the side of the machine.

Future Prospects

Once the UKT-3 cutter-loader is equipped for automatic steering and provision is made for automatic cable handling and automatic support advancement, the main requirements for man-free face working are met. Under such a setup faces 260 yd long could be mined in one shift by a small crew of men in the present 2-ft seam. Theoretically, one machine operator, three stable hewers and one mechanic or a total of five men, could extract 260 tons per shift, resulting in a productivity of over 50 tons O.M.S. Such figures, which are almost fantastic under present conditions, must be attained, however, if coal mining here is to meet competition from other energy industries.

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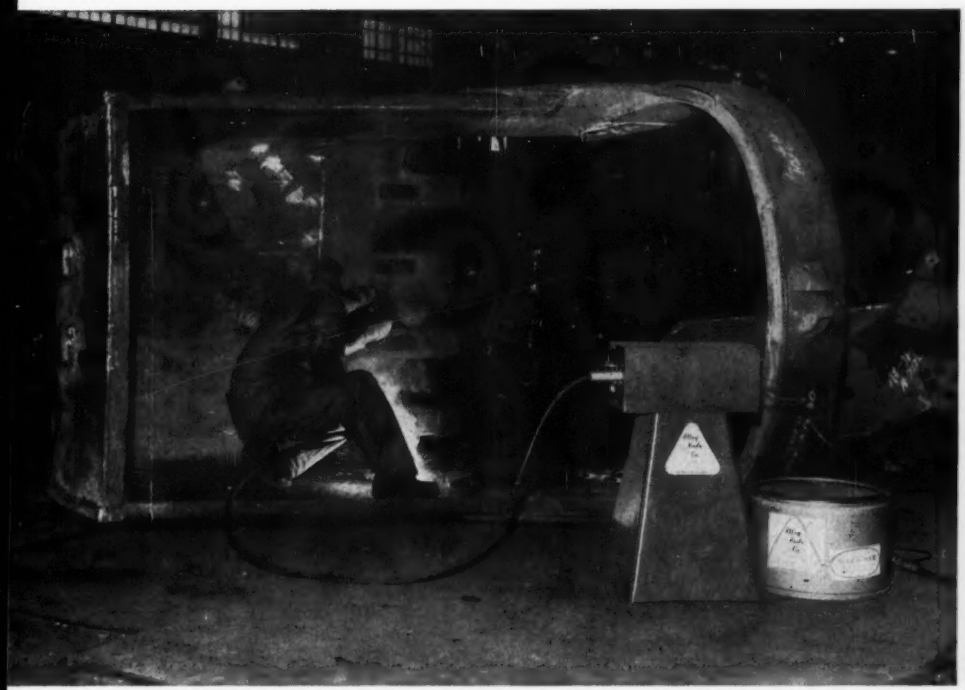

The Page Engineering Co. was founded in 1903 by Mr. John W. Page who originated the dragline method of digging. Today Page Engineering is the nation's leading manufacturer of dragline buckets, walking draglines and other equipment used in dragline operations.

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Now, new Wear-O-Matic WH semi-automatic wire developed by Alloy Rods Company fills both the requirements by producing high strength properties identical to those of 308 stainless electrodes while depositing absolutely crack-free weld metal. The Page Engineering Co. has replaced most 308 stainless welding in their dragline bucket production with new Wear-O-Matic WH alloy, gaining the economies of semi-automatic open arc welding and retaining the same high strength requirements for manganese attachment welding. Page engineers report Wear-O-Matic WH gives them the additional advantages of faster deposition and smoother arc characteristics—better than any semi-automatic wire they have ever used in the production fabrication of dragline buckets.

You too, can benefit from the experiences of Page Engineering. For any application involving the high strength attachment welding of manganese, whether it be production fabrication of manganese parts or field maintenance, Wear-O-Matic WH will do the job better than any alloy you are now using and do it semi-automatically. Contact your Alloy Rods Company distributor or Hard Surfacing Specialist for specific application information. Or write direct to Alloy Rods Company, P. O. Box 1828, York 14, Pennsylvania.

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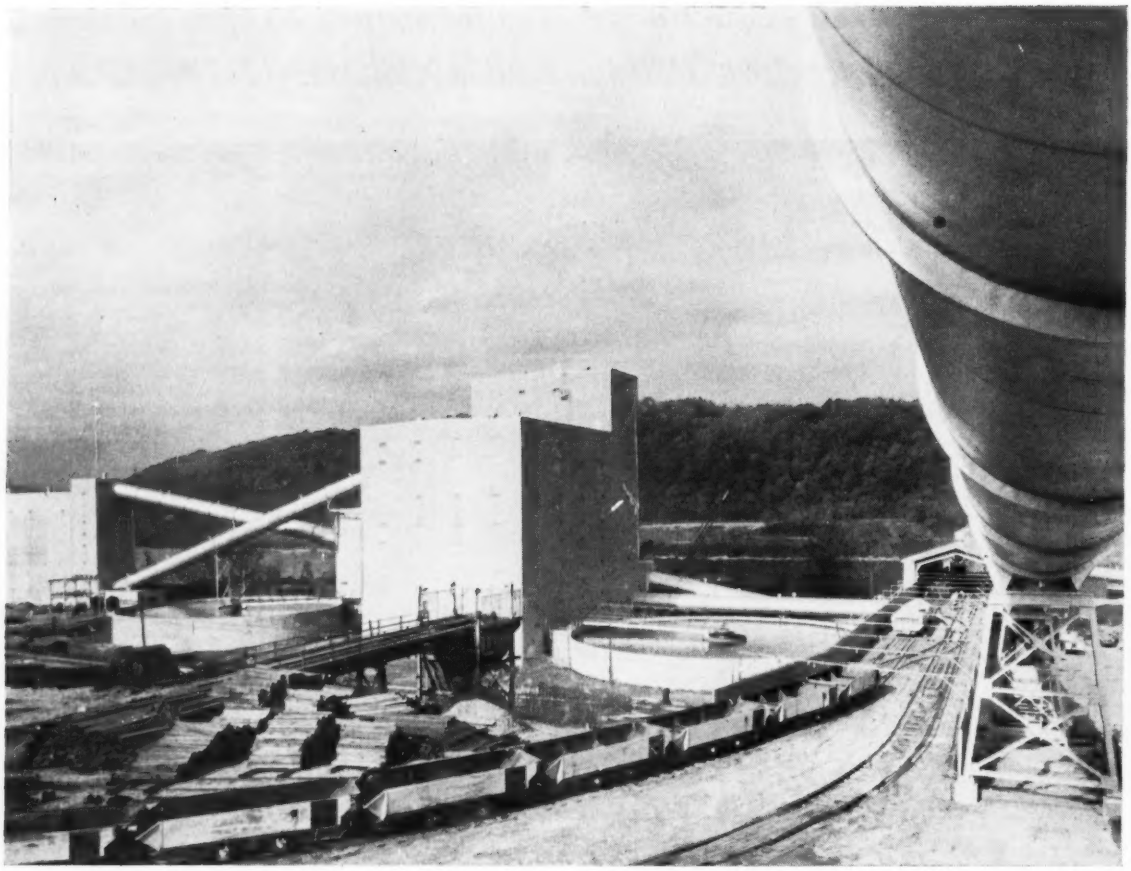
TWENTY YEARS OF LEADERSHIP IN THE DEVELOPMENT OF QUALITY ALLOY ARC WELDING ELECTRODES



NEW DESIGN CONCEPTS at U.S. Steel's 800-tph Maple Creek plant include pleasing architectural lines, sound-absorbing sheathing and prefabricated tubular conveyor galleries. Plant presently processes coal from six mines.

U.S. Steel Opens Maple Creek Project

New plant on the Monongahela River is the last word in modern architectural design for heavy industry. Special sheathing abates noise. Prefabricated, tubular conveyor galleries, the first in use, permit longer spans.

By **A. E. Flowers**, Associate Editor, *Coal Age*

INNOVATIONS in plant design plus application of special steels that withstand abrasion and corrosion while improving coal flow mark operations at United States Steel Corp.'s new Maple Creek preparation plant, New Eagle, Pa.

Among the innovations incorporated in the new plant are:

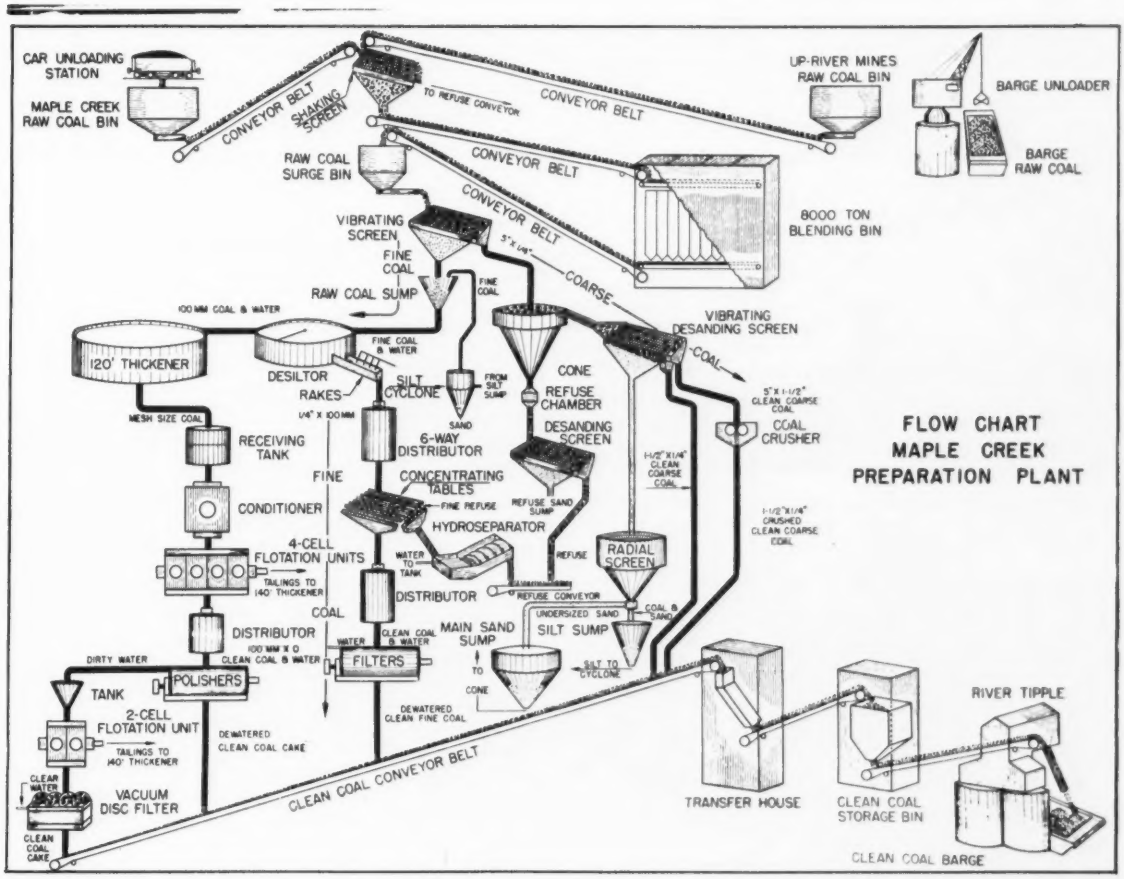
1. Architectural design that is pleasing to the eye and blends nicely into the community in which it is located.

2. First application of smooth tubular steel prefabricated conveyor galleries in any industry.

3. Soundproofing of the entire plant with special vinyl painted corrugated galvanized steel sheathing and fiber glass. (Sandwich construction).

4. Use of Fabreeka rubber pads between rails and ties on the trestle leading to the coal bin to reduce rail and wheel chatter. By enclosing the trestle over Route 88 the corporation was able to ballast the portion of the track to reduce noise and also eliminate dripping of rain water or fine coal to the street.

5. Pipeline transportation of 21 tph of fine refuse 3½ mi through a 5-in line.



FLOW CHART includes 8,000-ton blending bin receiving coal from six mines, sand-flotation cone, wet tabling and flotation cleaning processes. Standbys for many major units are incorporated in plant design.

Choosing the Site

Maple Creek mine taps some 17,000 acres of Pittsburgh coal that measures about 9x4 mi and lies along the Monongahela River at New Eagle, Pa. When plans were made to develop the Maple Creek property management selected the New Eagle site for the preparation plant and initial portal because it offered the following advantages:

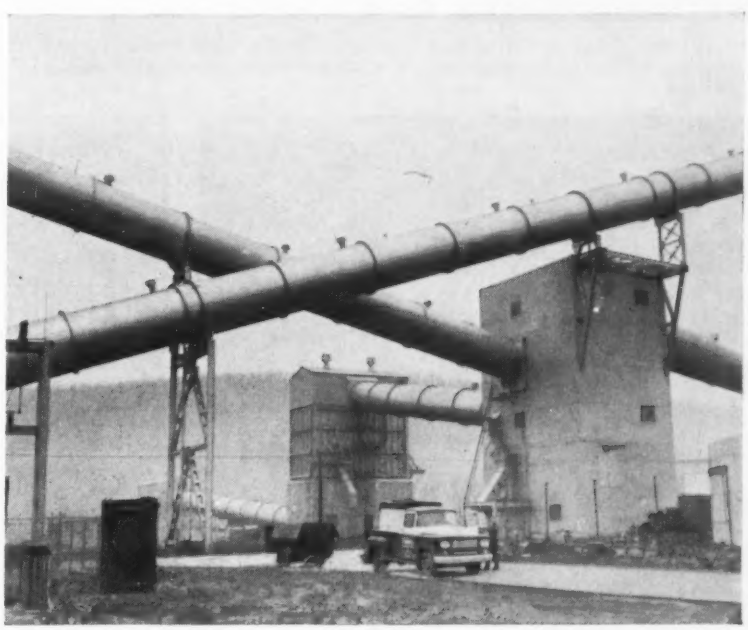
1. The portal would be near a good site for a preparation plant along the river.

2. Availability of river water for washer operation.

3. River transportation for incoming coal from up-river mines as well as for clean coal prepared at Maple Creek for the Clairton works.

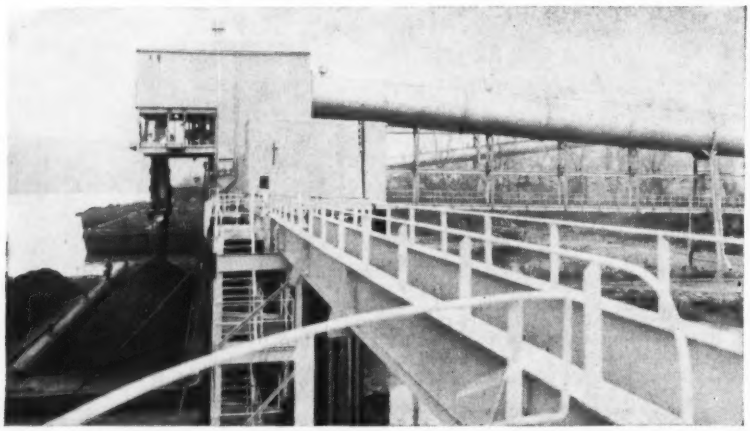
4. The coal could be tapped with a drift opening which would make possible economies in haulage, ventilation and drainage.

There also were some disadvantages of the site. For instance, it was in a



TUBULAR conveyor galleries, first in any industry, were fabricated in 40-ft sections for assembly at the plant. Sections are 10 and 11 ft in diameter.

INCOMING COAL from five up-river mines arrives in six-barge tows, is transferred to 400-ton bin by barge unloader at the rate of 560 tph.



OUTGOING COAL is fed to barge through telescopic chute. Barge payload is calculated by the displacement method. Coal goes down river to Clairton works.

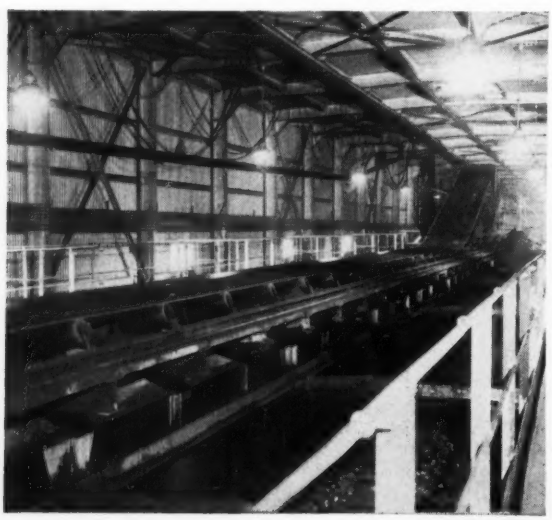
populated area and there was no suitable site for refuse and slurry disposal. As a consequence, it was necessary to establish an area about 3 mi from the New Eagle plant site for refuse disposal and build a dam to establish a settling pond for refuse slurry.

Plant Architecture

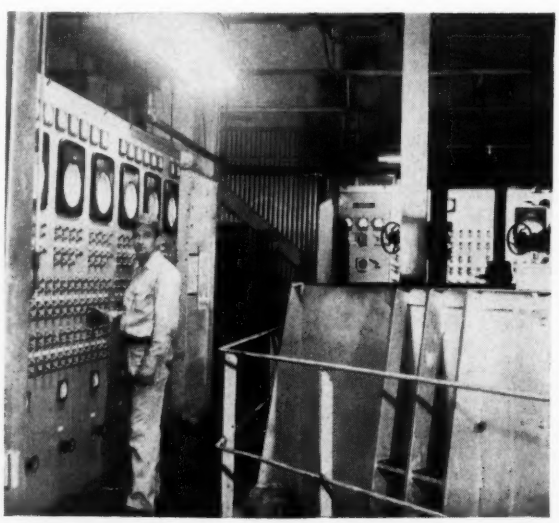
Since the logical choice for the Maple Creek facilities was at the New Eagle site, U. S. Steel's management devoted considerable time to developing a plant whose external appearance would be acceptable to the New Eagle community. Members of the U. S. Steel staff met with town representatives to receive their suggestions on making the project one of which all could be proud. Their suggestions were given thoughtful consideration and combined with those contributed by Allen & Garcia Co., American Bridge Div., U. S. Steel and engineers from the Frick District. These three groups combined ideas and skills to create a plant that is characterized by its neatness and simplicity of design. Louvers replace windows throughout the building to improve appearance as well as to reduce maintenance.

Tubular Conveyor Galleries

Maple Creek has the distinction of being the first plant in any industry to use tubular conveyor galleries. Aside from improving the appearance by replacing conventional rectangular gal-



TRIPPER BELT distributes coal automatically to 72 pockets of blending bin in programmed checkerboard pattern.



MAIN CONTROL CENTER is located beside sand-flotation cone. Panelboard has ammeters that show loads on units.

leries and numerous steel supports, the tubular structure offers a number of other advantages.

One of its outstanding advantages is that the tube supports its total live and dead load over a span of 110 ft as compared to 55 ft for the rectangular type of construction. Sections of tube, 10 and 11 ft in diameter, were formed from ⅜-in steel plate in 40-ft lengths for shipment to Maple Creek. The conveyor decking, walkways and handrail were completely shop assembled in each 40-ft section before shipment. Finishing coats of interior and exterior paints were applied before field assembly.

There are overhead ventilators in each tubular gallery and good lighting is provided for the full length of each structure. Water outlets are provided at each gallery for washing the interior.

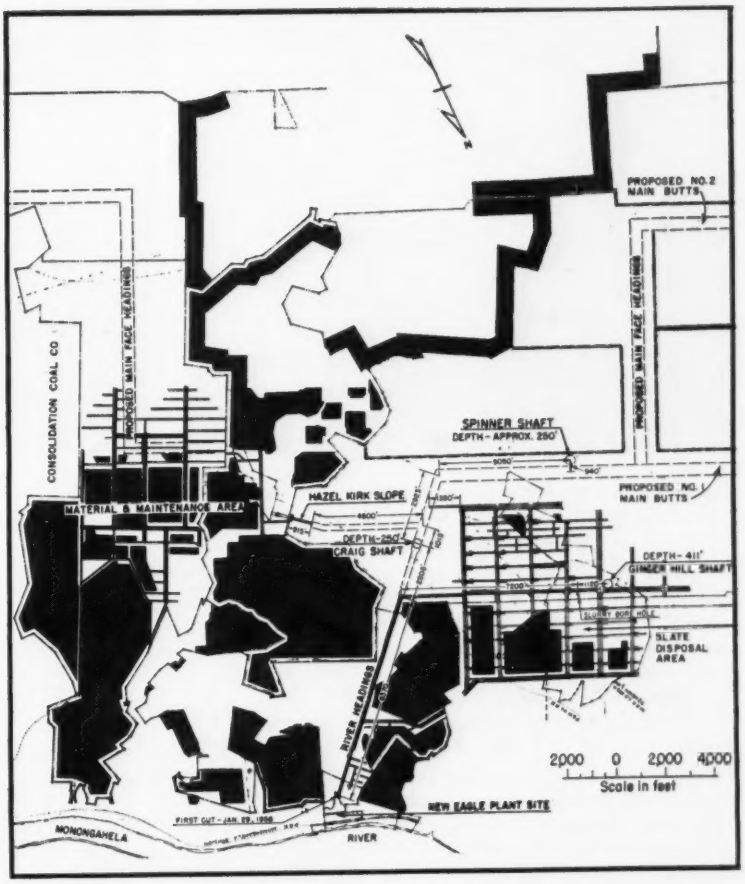
The portion of the tube below the walkway is coated with a special bituminous corrosion-resistant paint and serves as a sluice for all washdown water. This water is collected at intermediate points or at the lower end of the gallery for disposal. There are no obstructions inside the gallery upon which dust can accumulate; consequently, washdown and cleanup are simplified.

Soundproofing

In addition to creating a plant that would be pleasing to the eye, U. S. Steel took measures to minimize the noise level of the plant. To reach this goal, a 1-in layer of fiber glass was sandwiched between two layers of special vinyl-painted corrugated galvanized sheet steel. This type of sheathing confines the noise within the building and thus abates its projection to the surroundings. To further minimize the noise level, management does not employ a shift-announcing whistle.

Over 6,400 cu yd of concrete were poured for the main preparation plant and 3,823 tons of structural steel were erected. An additional 5,100 cu yd of concrete and 3,000 tons of piling were used in completing the blending bin and harbor facilities. Over 150 tons of stainless and special steels were used to reduce abrasion and corrosion problems as well as provide maximum strength with minimum weight.

Most chutes and flumes are built of USS Cor-Ten, a high-strength low alloy steel, and have bolted-in liners of USS A-R abrasion-resistant steel. Solid stainless steel and stainless-steel liners were used where easy material flow, corrosion resistance and long life are vital.



MAPLE CREEK PROPERTY includes 17,000 acres along the Monongahela River. Headings of old mine had to be rehabilitated to reach main body of coal.

Maple Creek Supervisors

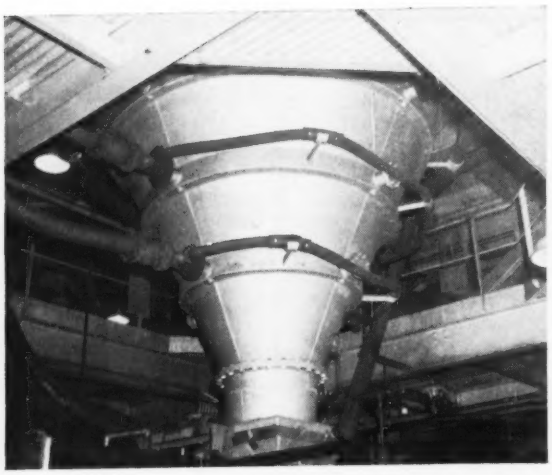
George Wydo, superintendent
Dan Ashcraft, general mine foreman
Les Anderson, general plant foreman (preparation plant)
Charles Harper, general maintenance man (mine)
Art Goodwin, general maintenance foreman (preparation plant)

Blending the Coal

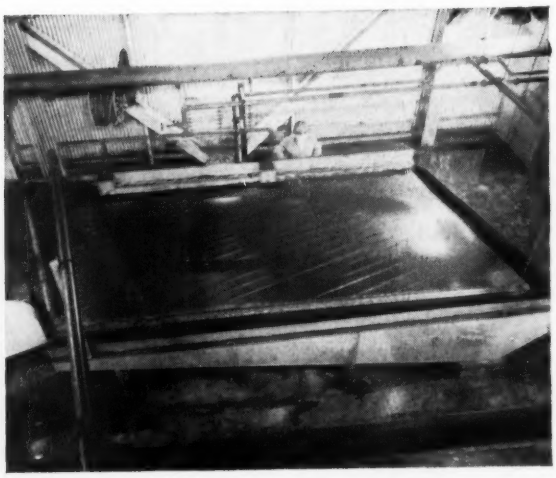
Maple Creek processes 800 tph of raw coal in three-shift operation. This feed includes coal from Maple Creek mine and five up-river mines as follows: Bridgeport, Maxwell, Karen, Leisenring, and Colonial. As coal reserves in the up-river mines in Fayette County are depleted, Maple Creek production will grow to maintain the rated feed to the plant.

Coal from the up-river mines comes to Maple Creek in 6-barge tows. A barge-unloading crane transfers the coal to a 400-ton bin at the average rate of 560 tph. Each barge is unloaded separately and its coal sampled automatically for analysis at the Maple Creek laboratory. Empty barges are dropped downstream to the clean-coal loading facility. Two apron feeders deliver 1,200 tph of coal from the barge-coal bin to a belt for delivery to the primary raw-coal shaking screen.

Coal from the Maple Creek mine is transported to the surface in 8.5-ton steel dropbottom mine cars which are pulled in 40-car trips by a 54-ton 8-wheel locomotive. The trip is split into 20-car units which are then



COARSE-COAL WASHING is handled by 18-ft-diameter sand-flotation cone receiving 5x¼ feed from 42-in belt.

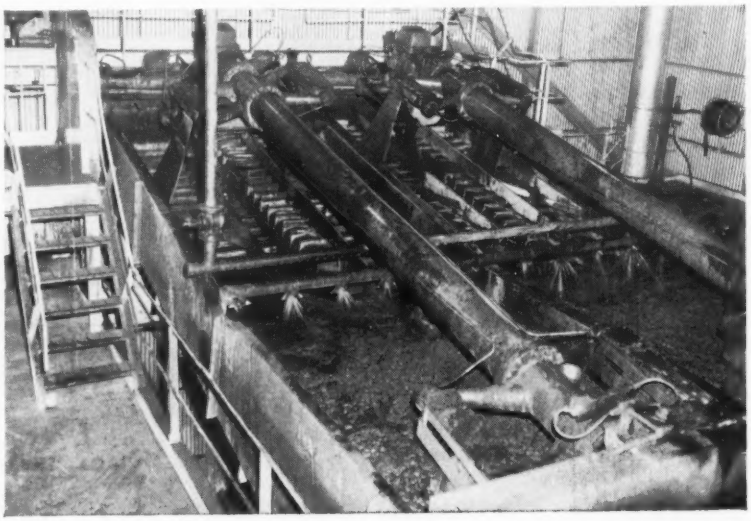


WET TABLES separate coal and rock from desilted fine feed delivered by four 6-way distributors.

pulled across a 700-ton steel storage bin.

Four independently controlled 54-in apron feeders deliver Maple Creek coal to a 60-in belt that conveys up to 1,400 tph of material to the primary shaker screen. There the raw feed is split into plus 8-in, 8x5, and 5x0 products, with the 8x5 fraction passing to a 24x60 single-roll crusher that makes a minus 5-in product. Coal is handpicked from the plus 8-in and also directed to the crusher.

Rock discharges over the end of the primary raw-coal shaker screen and passes to a 36x48 single-roll crusher for reduction to 3-in top size. This product joins the washer refuse on its way to the 500-ton refuse bin. Tramp iron and wood are removed at the picking tables for separate disposal.



RAKES pull concentrated solids from bottom of bowl desiltor which removes 100-mesh fines from table feed. Plant has two 44-ft diameter desiltors.

Raw-Coal Blending

From the screening and crushing house, raw coal travels on a 48-in belt to a transfer tower. There a manually operated gate is provided to divert raw coal to river loading if desired or to its normal route on a 48-in belt leading to the top of the 8,000-ton reinforced concrete blending bin. There the coal drops onto the tail end of a 48-in tripper belt and diverter.

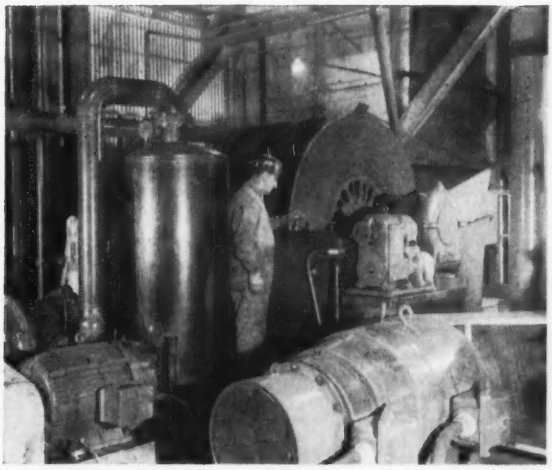
The blending bin, constructed with slip forms in one continuous pour, measures 219 ft long, 34 ft 4 in wide and consists of two major rows of nine cells, each of which is divided into four pockets. There are 72 pockets, each of which has a working capacity of 110 tons of coal.

The tripper belt extends over the two major rows of cells and is programmed for automatic pattern filling. Beginning at one end of the bin, the tripper delivers coal to an inside pocket on one side until it is full. It remains in the same position while coal overflows and fills the pocket immediately behind it. The tripper then advances to the next pocket and repeats the loading, thus completely filling four pockets in this cycle.

Loading then switches to the third pocket on the opposite side of the blending bin and a series of four pockets are loaded as previously described. Blending then continues from side to side in this checkerboard fashion until the end of the bin is reached. The tripper then retreats to the starting point at the opposite end of the bin, discharging coal into those pockets skipped on the previous pass.

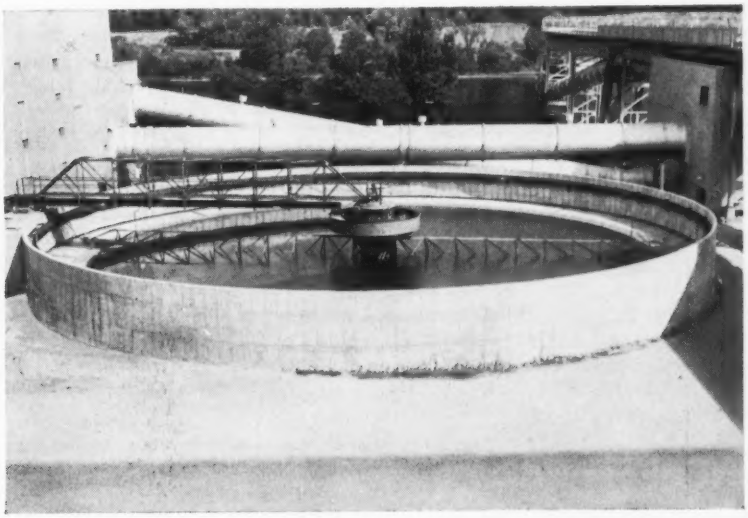
Coal is withdrawn from the blending bin through 18 feeders, each of which pulls coal from four pockets. But only six of the feeders operate at any one time to deliver 800 tph of blended coal to a 42-in collecting belt feeding a 42-in belt leading to the top of the preparation plant. The withdrawal pattern is automatically controlled.

Incoming coal discharges into five 65-ton surge bins which are filled through automatically-controlled di-



VACUUM FILTER removes water from extreme fines before they drop onto clean-coal belt leading to transfer house.

REFUSE DISPOSAL AREA is 3.2 mi from preparation plant. Rock is hoisted to surface by two 6.6-ton skips.



THICKENERS are important in the flotation circuit. A 120-ft unit concentrates raw feed and a 140-ft unit thickens tailings.

verter chutes. Each bin has its own vibrating feeder that delivers 200 tph of coal to a vibrating screen where the minus ¼-in is removed by wet screening. One bin, feeder and screen are held in reserve as standby units.

Coarse-Coal Washing

The raw 5x¼ discharges onto a 42-in belt that delivers it to an 18-ft Chance cone. Clean coal passes over three stationary stainless steel 1-mm screens to three double-deck vibrating screens for final desanding, dewatering and separation in 5x1½, 1½x¼ and ¼x0 products. The 5x1½ passes to a ring crusher that reduces it to 1½x0. A 30-in belt collect and transports the crusher product and the 1½x¼ to a 36-in belt leading to the transfer house.

The minus ¼-in material passes over a 1¼-mm stainless steel stationary screen and discharges onto a Hein-Lehmann radial screen with ¾-mm openings. Fresh-water sprays continuously wash the slurry as it flows over the screen. Undersize returns to the main sand sump to be returned to the Chance cone. Oversize flows to a silt sump from which it is pumped to a silt cyclone.

Coarse refuse passes over two desanding-dewatering screens and drops onto a 30-in belt. This unit carries it to the main refuse conveyor in the screening house.

Fine-Coal Cleaning

The ¼x0 from the wet screens is flumed to a sump from which it is pumped to a pair of 44-ft bowl desiltors where fine silt is separated. The desilted portion flows to four 6-way distributors feeding 24 wet tables.

Clean coal passes to a battery of six centrifugal filters, one of which is a spare, for mechanical dewatering. A 36-in belt under the filters carries the dewatered product to the 36-in main clean-coal belt and thence to the transfer house for delivery to a 500-ton steel storage bin.

Table refuse is directed to a spiral classifier for dewatering and subsequent delivery to the coarse-refuse conveyor leading from the plant.

The 100Mx0 silt fraction removed by the desiltors collects in a 120-ft thickener from which concentrated solids are pumped to three conditioner units feeding three 4-cell flotation units. The clean coal product is flumed to a 3-way distributor, thence to three centrifugal filters. A 24-in belt carries the dewatered product to the clean coarse-coal belt.

Effluent from the centrifugal filters discharges into a 2-cell flotation unit, which separates very fine coal and refuse particles not recovered in the filters. A 5-disk vacuum filter dewaters the clean coal and discharges it onto a 24-in belt for delivery to the coarse-coal belt. Tailings are sluiced into the 140-ft refuse thickener. Fil-

Suppliers of Maple Creek Equipment

Plant Design	Allen & Garcia Co.
Plant Erection	American Bridge Div., U.S. Steel Corp.
Filters	Bird Machine Co.
Spiral Classifier, Akins	The Mine & Smelter Supply Co.
Desiltor	The Dorr-Oliver Co.
Chance Cone	Fairmont Machinery Co.
Raw Coal Feeders	Jeffrey Mfg. Co.
Magnet	Magnetic Eng. Mfg. Co.
Elevator	Montgomery Elevator Co.
Crusher (clean coal)	American Pulverizer Co.
Crusher (refuse)	McLanahan & Stone Corp.
Crusher (R-O-M)	McLanahan & Stone Corp.
Samplers	The Galigher Co.
Platework	American Bridge Div., U.S. Steel Corp.
Screens (raw)	W. S. Tyler Co.
Screens (clean coal)	Allis-Chalmers Mfg. Co.
Screens (refuse)	Lecco Mchy. & Eng. Co.
Pumps	Barrett-Haentjens, Morris Machine Works, Wilson-Snyder
Belt Scales	Industrial Physics & Electronics
Slurry Screen (radial)	Hein, Lehman & Co. (Nolan Co.)
Thickeners	The Dorr-Oliver Co.
Air Compressor	Chicago Pneumatic Tool Co.
Inter-communication System	Femco, Inc.
Corrugated Siding	U.S. Steel Corp.
Dust Collectors	American Air Filter Co.
Motors & Controls	Westinghouse Electric Corp.
Belt Conveyors	Barber-Greene Co.
Belting	Acme-Hamilton Mfg. Corp.
Shafts & Pulleys	Dodge Mfg. Co.
Barge Unloader	Bucyrus-Erie Co.
Piping	National Tube Div., U.S. Steel Corp.
Washing Tables, Distributors	Deister Concentrator Co.

ter effluent returns to the plant water system.

Refuse Handling

Because no refuse area is available near the plant all coarse waste must be hauled 3.2 mi underground to the Ginger Hill shaft, unloaded and hoisted to the surface disposal area.

Coarse refuse travels by a 36-in belt to a transfer tower, thence to a 500-ton steel storage bin located adjacent to the portals. Four air-operated gates discharge rock to mine cars which are pulled in 25-car trips by a 54-ton locomotive to the Ginger Hill shaft bottom. There the rock drops into a 285-ton steel-lined bin from which it is fed automatically to two 6.6-ton self-dumping skips and hoisted to the surface by a fully automatic, amplidyne controlled hoist.

At the surface, the refuse drops into a 200-ton steel surge bin for loading into 32-ton carry-alls that carry it to the disposal area.

Fine-mesh refuse from the flotation circuit is flumed to a 140-ft diameter concrete thickener prior to being discharged from the plant through a quintuplex plunger pump. This unit pumps or forces the material through 5-in extra heavy steel pipe to a borehole near the Ginger Hill shaft, then to the surface sludge pond. Handling 260 gpm, this pumping system operates at approximately 1,400 ft total dynamic head.

Barge Loading

From the transfer house, a 48-in belt carries clean coal to a 500-ton steel storage bin. Two vibrating feeders then transfer it to a 48-in belt terminating at the river dock. Barges are loaded through two chutes.

Sampling and Testing

Maple Creek has its own complete laboratory for operations control. There are three automatic sampling stations: one for sampling raw coal from Maple Creek mine and each barge emptied by the crane, one for sampling blended raw coal flowing to the washer, and one for the clean product.

Belt scales are provided for weighing raw coal and blended raw coal feed to the washer. Clean coal in the barges is weighed by the displacement method.

Developing the Property

Some of the ground work was done for the Maple Creek mine and preparation plant as early as 1950. The first specific step toward developing the reserves was purchase of the remaining coal in the Hazel Kirk field in 1951. This purchase enabled the corporation to combine the Mingo field with other fields previously purchased and also made possible acquisition of surface needed for the Hazel Kirk supply yard.

In July, 1957, additional surface was purchased to drive a 870-ft slope at Hazel Kirk to reach coal in the Mingo field. This slope was completed in December, 1958, and will serve as a supply portal. The main repair shop for major overhaul work also will be located here.

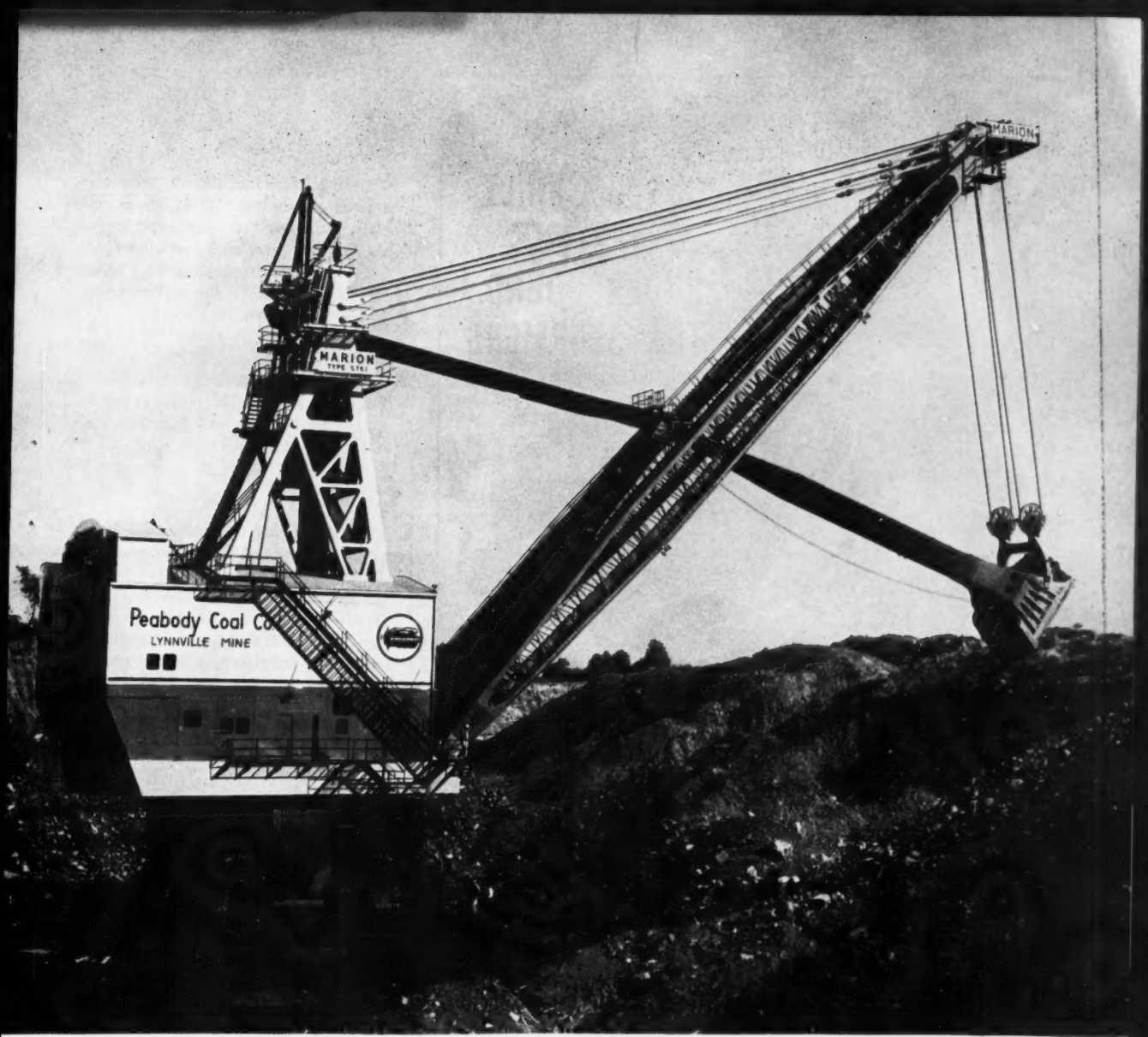
Work began at the New Eagle mine site in January, 1958, when three drift openings were made to connect with four headings which had been driven some 30 yr ago. To reach the main body of coal these four old headings had to be rehabilitated for a distance of 8,200 ft. Then to reach the Ginger Hill shaft location which was planned to handle refuse, three more headings had to be rehabilitated an additional 8,300 ft.

To prepare the rock handling facilities at Ginger Hill, a 411-ft shaft was sunk, a 285-ton bin was carved out of the bottom rock and an automatic skip hoist was installed. A borehole also was drilled for the 5-in refuse line.

A 12-ft-diameter circular ventilation opening, Craig Shaft, was sunk 250 ft to the coal 2 mi from the drift openings at New Eagle. Here, too, are located AC and DC substations supplying power to the mine.

The 9x12-ft Hazel Kirk slope is 3 mi underground from the New Eagle portals and will be reached early in 1961. Five headings will make a 4,600-ft link between the slope and river headings.

Spinner Shaft, which is now under construction, will be reached during the summer of 1961. Located 3½ mi from New Eagle, this opening will be a three-compartment elliptical shaft 36x18 ft and 250 ft deep. It will serve as the main man portal and will also be used for ventilation. Main offices and service buildings also will be constructed there. This shaft will be reached underground by driving nine



Bethlehem Hoist Ropes Provide Muscle for World's Largest Shovel. This 65-cu-yd shovel, as tall as a 15-story building, scoops enormous quantities of overburden at the Lynnville, Indiana, mine of Peabody Coal Company. With its 170 ft boom, and six 187-hp swing motors, it has a maximum cutting height of 146 ft, and a maximum dumping height of 106 ft. In other words, it can deposit overburden atop a 10-story building, the length of a football field away.

Bethlehem Formset Purple Strand is used for the shovel's huge twin lines. These ropes are 2⅝-in. in diam and 640 ft long. Purple Strand, a tough, durable wire rope, is right at home in applications of this type, where it turns in an economical performance, day after day.

Bethlehem Steel Company, Bethlehem, Pa. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem Wire Rope

BETHLEHEM STEEL

BETHLEHEM WIRE ROPE
BETHLEHEM STEEL

ENSIGN -- CUSTOM BUILT PORTABLE UNDERGROUND TRANSFORMERS

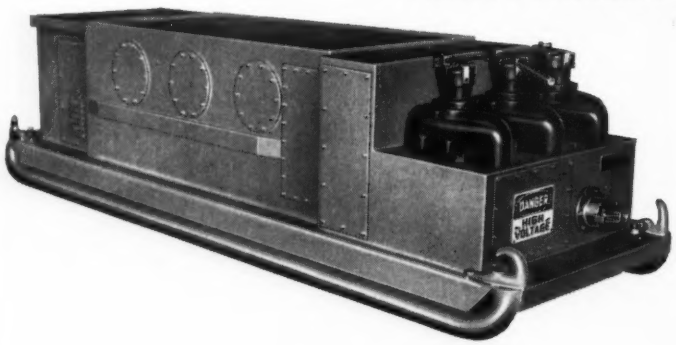


Photo illustrates 225 KVA
Nitrogen Filled Unit
7200 Volt Primary-36" High

Units are of rugged construction with pipe or flat channel type skid base to withstand severe handling.

Available in nitrogen filled or ventilated types . . . coils are Class H silicone insulated to give high moisture repellancy and thermal stability.

Units available in sizes 75 through 600 KVA . . . complete with standard components with such special features as desired by purchaser.

"PRODUCT OF ENSIGNEERS"

ENSIGN
ELECTRIC AND MANUFACTURING CO.
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headings 8,000 ft from Craig Shaft.

Mining Plans

Mining plans call for full seam extraction, including 12 in of draw-slate, with continuous miners. Shuttle cars transport coal from the face to 8.5-ton steel dropbottom mine cars, which are pulled to the surface by a 54-ton locomotive.

Mine locomotives are operated with DC power supplied by conversion units at Craig shaft and the New Eagle portals. The DC power is transmitted by 1-million and ½-million cir mil feeder and 6/0 trolley wire.

Track Construction

Permanent main haulage track is constructed of 85-lb rail laid on 6x8-in by 6½-ft treated ties spaced on 24-in centers. Track gage is 44 in. Track is ballasted with size 2B slag and tightly tamped with handheld pneumatic air tampers, after which the ballast is dressed to the top of the ties. A two-track system is being built, with maximum grade held to 3% and most of it not exceeding 1%.

All 85-lb rail joints are electrically welded by a special process developed by Frick District maintenance personnel. After the joint is preheated to a specific temperature, a flat plate is welded to the bottom of the rail, a plate is welded to each side of the web and a V-notch made in the ball of the rail which is then filled in successive passes of welding rod. The joint is reheated and covered with a blanket of rock dust which retards cooling. The complete operation is done under controlled heat made possible by use of heat-sensitive crayons. The cooled joint is ground smooth with an air grinder before that section of track goes into service.

Permanent mainline trolley installation includes 6/0 wire suspended below 1- or ½-million cir mil feeder in a semi catenary. This method provides a "cushioned" trolley wire.

Another feature of the trolley-wire installation is the absence of trolley frogs on the main haulage. Substituting for them is parallel wire extending 150 ft at switch points so that the trolley pole can be transferred from one to the other when traveling through a chute. When locomotives travel on straight track the possibility of a dewirement is eliminated.

12-year old McNally Plant produces competitively

—*even in today's tough markets*

This month the "Man from McNally" tells about another satisfied owner of a McNally Pittsburg "advanced design" coal preparation plant.

Ahead of its time in 1947...

THIS McNALLY PLANT HAS PRODUCED 10,755,294 TONS IN 12 YEARS

Snow Hill Coal Corporation Preparation Plant, Terre Haute, Indiana

This high efficiency McNally plant—owned and operated by Snow Hill Coal Corporation, Terre Haute, Indiana—has been turning out top quality products without interruption for 12 years. And thanks to able management and its "years ahead" design, it has remained competitive in a fast-moving market.

Capacity is 600 tph, with a raw coal hopper of 50 tons, which evens out intermittent feed. Raw coal is classified on screens to 1¼", 2", and 6". These products can go to fine or coarse coal washers, or to loading-out chutes. Two McNally Norton baum type washers handle the size 6 x 1¼ and 1¼ x 0. A washed coal classifier handles the cleaned product, and it is loaded out on the six tracks according to size, which ranges from 6 x 4 to ⅛ x 0.

Two centrifugal dryers handle the ⅛ x 0 coal. A McNally Norton washer receives the 1¼ x 0 product when it is not loaded out as raw coal. Also, when the 6 x 1¼ coal is not loaded raw, it goes to the coarse coal washer. Middlings from the coarse washer go to a crusher for reduction to 1¼ x 0 and are then rewashed in a McNally Norton rewash box.

ASK THE MEN WHO KNOW COAL FROM THE GROUND UP

McNALLY PITTSBURG

MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

Washed product from all three washers goes to a classifying screen for separation into various sizes with water. The wet coal then goes to dewatering vibrators.

The six-track loading-out system permits flexibility of loading and mixing of cleaned or raw coal for individual customer's needs.

Mail the postcard today—

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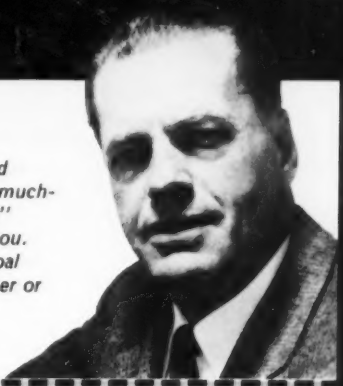

You'll find the experience and technical "know-how" of the much-traveled "Man from McNally" can be of real assistance to you. He has the answer to your coal preparation problems, whatever or wherever they are. Get in touch with him soon.

Gentlemen:

Please send me information about the following equipment:

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- ☐ Crushers ☐ Automatic Samplers

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COMPANY_____

CITY_____ STATE_____

C

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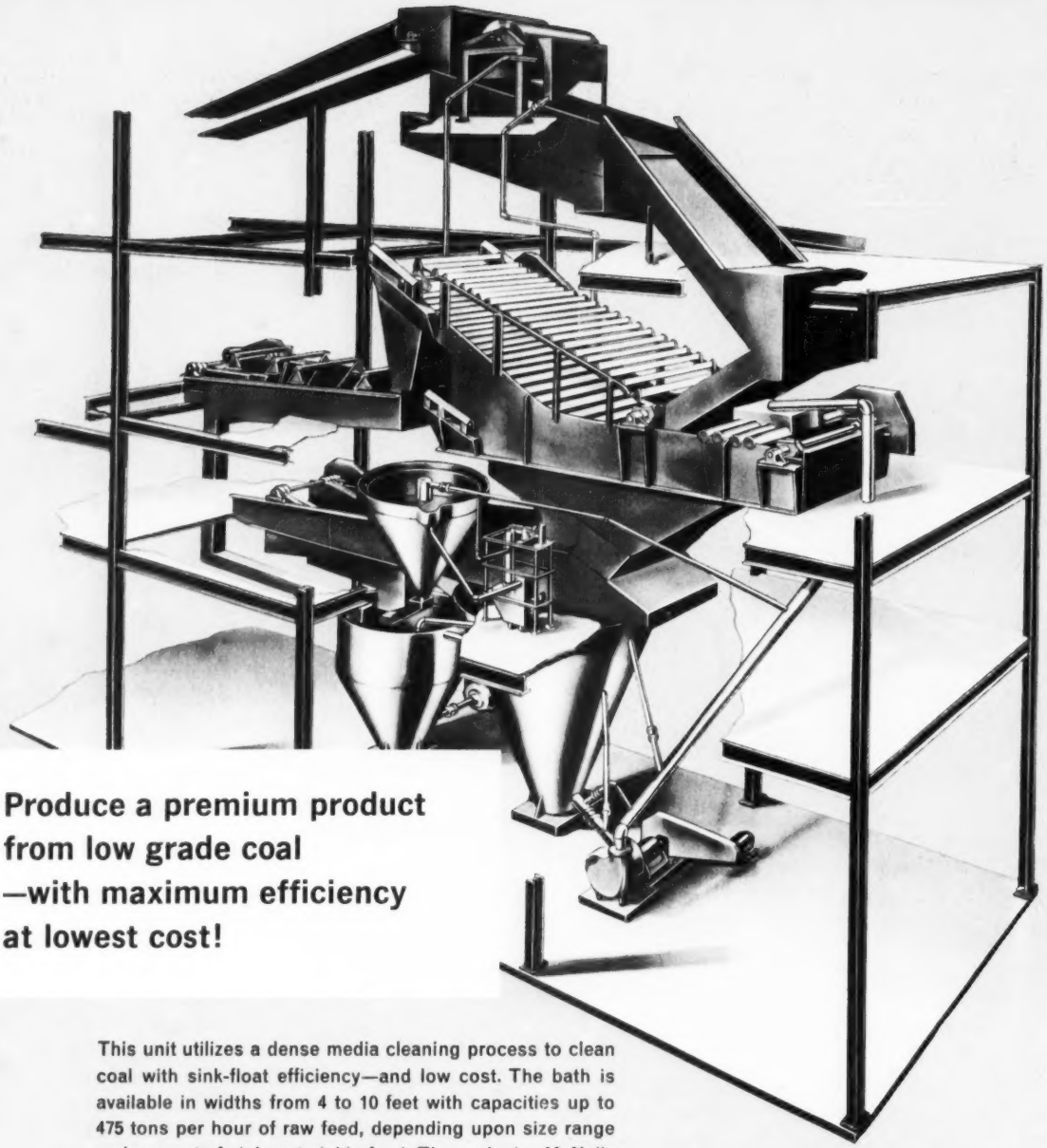

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This unit utilizes a dense media cleaning process to clean coal with sink-float efficiency—and low cost. The bath is available in widths from 4 to 10 feet with capacities up to 475 tons per hour of raw feed, depending upon size range and amount of sink material in feed. The exclusive McNally Tromp principle of laminar flow and hydrometer type density regulation makes a separation of near laboratory precision.

McNALLY TROMP

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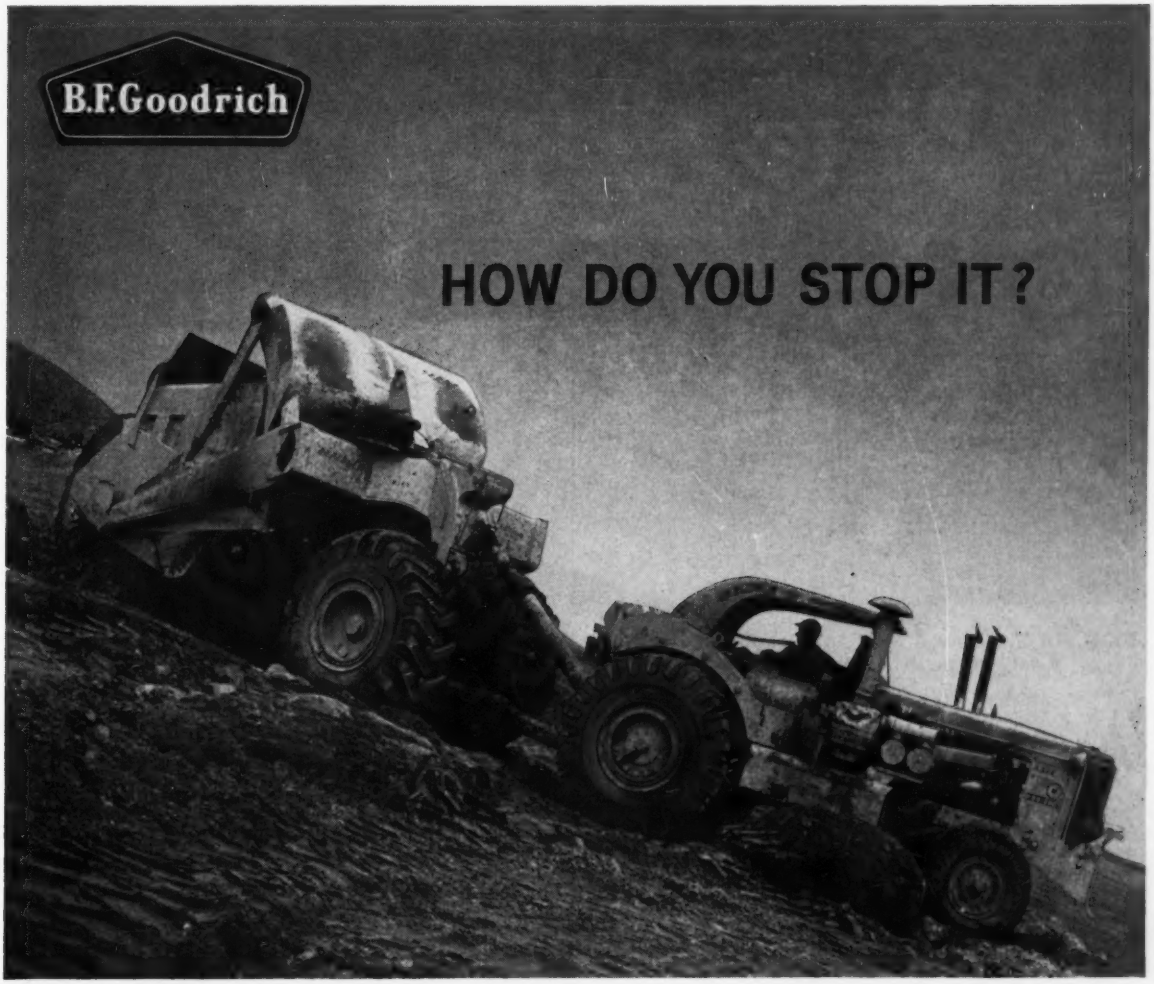
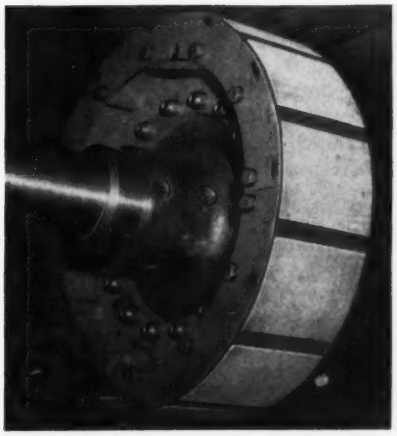




Hi-Torque brakes give uniform pressure, *full circle contact.* This provides maximum effective braking surface in the same size unit...double the braking power.

HI-TORQUE BRAKES!

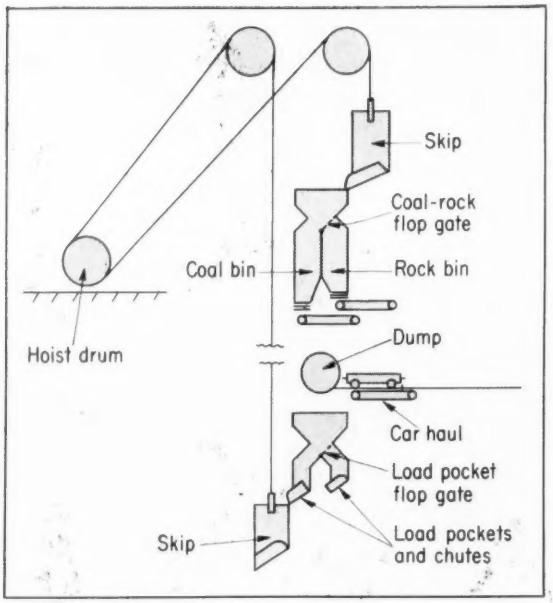
B.F.Goodrich Hi-Torque brakes cut stopping distance approximately in half, compared to conventional two-shoe brakes tested on identical vehicles and loads. The added safety factor with these brakes means you can haul bigger loads more safely, operate on faster cycles. More difficult off-highway jobs can be tackled.

For *double the braking power* on your heavy weight vehicles, specify Hi-Torque brakes as original equipment. These brakes are now available on heavy dump trucks, tractor-scrapers, coal haulers, mine trucks and other big vehicles, from several manufacturers.

For complete information ask the manufacturer of your equipment, or write *B.F.Goodrich Aviation Products, a division of The B.F.Goodrich Company, Dept.* **CA-6,** *Akron, Ohio.*

B.F.Goodrich Hi-Torque brakes

NEW HOIST at Federal No. 1 is truly automated, meaning it needs no supervision or manual operation.



PHYSICAL LAYOUT of hoist and underground and surface bins is shown in this schematic diagram.

Automated Hoisting—An Integrated System From Car Haul to Surface

A single pushbutton at EGFA's Federal No. 1 mine, Granttown, W. Va., sets in motion an automatic hoist sequence, including car hauling and dumping, skip loading, hoisting and skip unloading, either coal or rock.

By **W. J. McDonald,** Application Engineer, General Electric Co.

J. Erskine, Chief Electrical Engineer, Eastern Gas & Fuel Associates, Inc.

WHY NOT TIE individual automatic units of car unloading, skip loading and hoisting together to make one integrated automatic system? This question was asked in the stages of planning the new facilities for the Eastern Gas & Fuel Associates Federal No. 1 mine Granttown, W. Va. All parties involved in supplying major portions of the facility or installing the equipments as well as Eastern Gas & Fuel participated in discussions on the subject. It was decided that with well-coordinated planning and engineering, such a venture would be successful and advantageous.

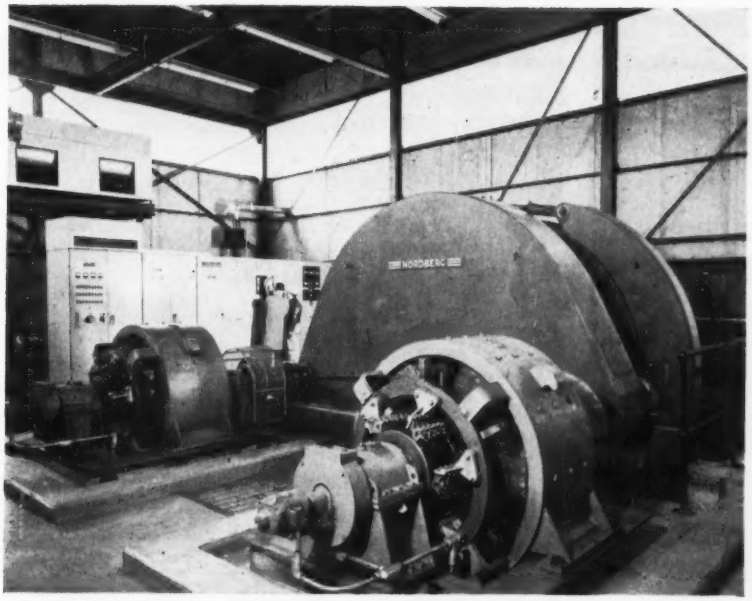
The Eastern Gas & Fuel system started producing coal in July, 1958. It can now be said that, after more than a year of operation, the venture has been very successful.

This new integrated system is significant for several reasons. For one thing, it's the first example of an automated coal mine hoisting system—automated in the sense that it is self-activating and requires a human operator infrequently only for determining whether a skip should be unloaded into a coal bin or rock bin at the top of the shaft.

Although automation as such has been slow in coming to mining operations, its acceleration during the 1960's will be rapid. According to one widely accepted industry estimate, 80% of all new larger mine hoist systems will be automated during the next decade. Also, many existing manual hoisting systems will be converted to automatic operation. This is particularly significant in view of the fact that current conservative estimates are for about 80 new mine hoist installations throughout the U.S. in the 1960-1970 period.

Significant improvements in overall operating efficiency and major reductions in operating costs are provided by use of the integrated-automated hoisting system. Savings effected here can be put to use elsewhere to improve operations where, perhaps, automation is not feasible at present.

Since this is an integrated, automated system, it might be well to set a frame of reference before examining in detail the operation and content of the system. "Integrated", in this sense, means that drives and controls of the various units are tied



THE 10-FT DRUM of the hoist is driven by two 400-hp DC motors, each receiving power from a 400-kw generator.

together to form a single, coordinated system with inter-related reactions to varying operating conditions. "Automated"—an overworked, often misused, term that means different things to different people—is used here in its real sense, that is, a self-operating system that requires no manual supervision or operation once it has been placed into operation by a manually activated pushbutton.

The system accepts loaded coal cars, empties them, loads the hoist skips, hoists them to the surface, and deposits the loads in a coal or rock bin.

System Content

The system (see schematic diagram) includes the following:

1. Nolan car haul and dump with AC drive and automatic control.
2. Loading bin with automatic flop gate. The pneumatically driven flop gate directs coal or rock into either of two load pockets.
3. Two skip loading pockets with loading chutes. The loading chutes are engaged mechanically by the hoist skips for skip loading. Counter balances return the skip loading chute to the closed, latched position as the loaded skip is hoisted.
4. An automatic, balanced 10-ft drum, 800 hp DC, dual-motor adjustable-speed mine hoist. The mechanical parts were supplied by Nordberg Mfg. Co. and the electrical equipment by General Electric Co. The mine hoist skips are 10-ton (load), bottom-dump types supplied by Connellsville Mine Supply Co.
5. The skip dump, including a rock bin, coal bin, and automatic flop gate to direct hoisted material into the proper bin. Each bin is provided with a level detector.
6. The sensors, a major portion of which are magnetic limit switches, and the G.E. integrating control panel. The integrating panel is located adjacent to the car dump and also serves as an operating station.

Operating Control

The integrating or underground control panel has front-mounted operational switches, pushbuttons, and indicating lights. Each of the controlled units may be operated manually or semi-automatically or set up for full system automatic operation at this point. The car haul and car dump may be manually jogged or set up for automatic recycling. The flop gates may be positioned in either of two positions or set up to function as required in automated operation. The mine hoist may be caused to make a single trip or set up to operate as a function of being loaded; that is, set up for full automated operation.

In order to quickly determine existing operating modes and conditions, indicating lights are mounted and grouped appropriately. Position indicating lights are of pertinent interest during operation. These are provided for the two skip-loading chutes, lower and upper flop gates, and the bin-level indicators. The lights really tell the story of operation and are useful in setting up the system for full automatic operation.

Set-up for Automatic Operation

To set up the system for automatic operation, several steps must be taken, as follows:

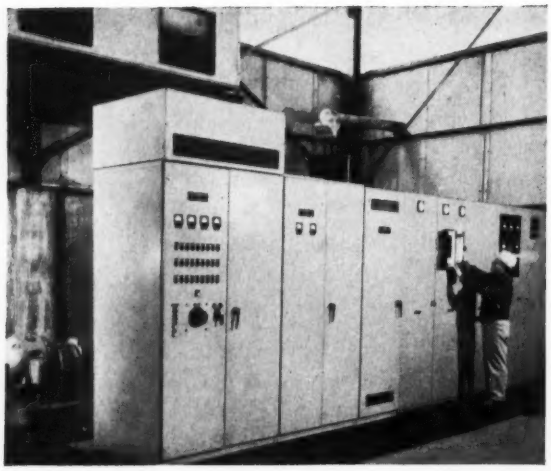
Mine hoist equipment is started and operated manually or semi-automatically from the hoist house to locate the skips at the end of travel. Control of the hoist is taken over by the underground control panel. The operator at the underground panel can then set the mine hoist control for automatic operation. A load is manually dumped into each load pocket. One of these loads goes through to the down skip. When this is loaded, the hoisting is initiated and a second load is manually dumped into the load pocket. During this operation, the load pocket flop gate is positioned manually. Following the third dump, all mode selector switches are set for automatic operation and the system continues on its own.

Automatic Operation

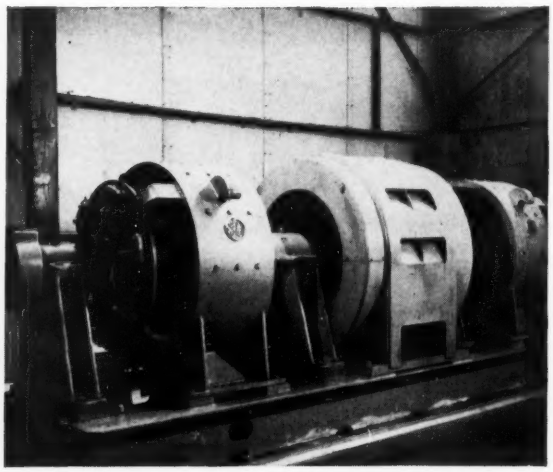
When the system is set up for automatic operation, all units operate in sequence as long as cars are available. Each operation is dependent upon successful completion of a preceding one.

The following illustrate the interdependence of functions and some of the protective features:

1. The car haul operates as a function of the car dump returning to the upright position.
2. The car dump operates only after a car is positioned, the load pocket flop gate is in an extreme position, and the load pocket skip-loading chute has opened and closed since this pocket was last loaded. This feature prevents dumping more



CONTROL CENTER includes rotating- and magnetic-amplifier regulators and current-limiting m-g set starter.



MAIN M-G SET for Federal's new hoist consists of two 400-kw DC generators and a 900-hp synchronous motor.

than one load of material in a pocket or skip.

3. The mine hoist will start a hoisting trip if the down skip is loaded, the upper flop gate is in the correct position, and the bin associated with the flop gate position is not full.

4. If the upper bin becomes full, the hoist will not restart until sufficient material has been moved to make room for another skip load. When such a stoppage occurs the car haul, car dump, and load-pocket flop gates operate only to fill the empty load pocket. Then this portion of the system also waits for hoisting to continue.

5. When cars are unavailable, the hoist will empty the load pockets and wait to be loaded.

Special Features

Although the mine hoist starts as a function of being loaded, it was designed and will start itself with a half-load deposited in a skip. The reason for responding to half-load is that two sizes of mine cars were in use during the initial stages of change over to the new system and new cars. On occasion, the smaller cars were used to haul rock (capacity of about five tons) and loads were hoisted automatically.

A novel rope-stretch technique is used for detecting a loaded skip. Successful operation basically depends on two things in addition to rope stretch: accurate spotting of the skip, and detecting the loaded and unloaded skip positions automatically.

To achieve accurate skip spotting, in addition to other reasons, the hoist control includes a high-performance speed regulator. This provides essentially constant approach speed regardless of skip load.

Hoist service brakes are primed prior to stop to minimize brake setting time. The final stop is initiated by skip position at the load pocket, rather than at the surface dump, to eliminate the effect of rope stretch on stopping accuracy.

To initiate stop as a function of skip position, and, to detect a change in skip position—a result of load causing more rope stretch—magnetic limit switches are used. A magnet mounted on each skip causes the limit switches to operate. The magnetic limit switch requires no mechanical engagement. The switches used are G.E. type CR9440-QS-2 watertight, shock-resistant, long-life units called "Magnetectors".

The Magnetector limit switches are also used to detect flop-gate and loading-chute position. In all cases, the switches are mounted to a stationary part. The magnets are mounted to the moving part.

In the planning stages, it was anticipated that occasionally one or two rock cars would be included in a train of coal cars. The control is programmed to insure that rock is dumped into the proper bin at the surface without the operator having to remember when such a load is hoisted. The control operates as follows: The operator pushes a "Rock" pushbutton when the "rock" car goes on the dump. He then can forget that load and the control will automatically move the upper flop gate at the proper time to dump the rock load into the rock bin. After the "rock" skip is dumped, the flop gate returns to the "coal" position to receive coal.

Experience during the last year indicates this feature has been used very little due to the grouping of rock cars. It probably would not be included again for a similar operation.

Mine Hoist Drive and Control

The basic mine hoist equipments are all located in a structural steel-corrugated steel hoist house at ground level. The drive includes two 400-hp, 450-rpm, 250-V, open, 40 deg C, shunt-wound DC mine-hoist motors. The motor generator set includes two 300-kw, 1,200-rpm, 250-V, open 40 deg C shunt-wound DC mine-hoist generators and one 900-hp, 1200-rpm, 2,300-V, three-phase 60-cycle, 0.8 power factor, open 40 deg C synchronous motor.

The control panel line up includes (1) reduced voltage reactor synchronous motor starter with field application, (2) synchronous motor four-step, 0.8 power factor leading, reactive KVA regulator, (3) adjustable-speed amplistat-amplidyne mine hoist control with speed, acceleration rate limit, and current-limit regulators.

The excitation motor generator set is comprised of one 5-kw, 250-V DC multifield amplidyne, one 17-kw, 250-

V DC, flat-compounded exciter, and one 40-hp squirrel-cage induction motor. The amplidyne supplies excitation for the two mine-hoist generators. The constant-potential exciter supplies control power and excitation for the two mine hoist motors and the 900-hp synchronous motor.

The heart of any adjustable speed DC mine hoist control lies mainly with the regulators since hoisting performance largely depends on this equipment. The regulators applied on this hoist are modern equipment using the high-gain, fast-response characteristics of push-pull amplistats and multifield amplidyne.

The high-gain, high-performance speed regulator assures that the hoist system will essentially hold reference speed regardless of load. Such a system is not sensitive to changes in motor field current or changes in machine heating. To assure constant preset speed programing, constant potential references are used.

The rate limit regulator assures essentially linear acceleration and deceleration throughout most of the speed range. The rate of acceleration and deceleration is adjustable.

The current limit regulator is a sharp cut-off type regulator which limits the current and torque the drive is called upon to supply. When these units were installed, extensive tests were made to evaluate system performance. The system performance was found to be better than the predicted and designed characteristics.

The speed regulation was found to be 99.8% at full speed (0.2% change in speed with 100% change in load). The rate of acceleration and deceleration was found to be essentially linear with a smooth round-out going into the reference speed.

The current-limit regulator has a sharp cut-off characteristic (less than 10% of the limited current level) and under transient conditions produced no more than 6% overshoot with the service brakes applied as a torque step function at 100% hoist speed, or with 100% speed reference step function with the brakes set to hold zero speed.

Hoist Cycle

The hoist cycle was designed to deliver 880 tph, or 10 tons per cycle and a cycle time of 41 sec. Rope speed is 1,000 rpm. In order that the loading chutes at the bottom and the dumping horns at the dump not be impacted too greatly as the skip engages these units, both ends of the cycle have short creep-speed distances.

Hoist Programming

The hoist cycle is programed by two separate means. To accelerate the hoist, the speed reference, which is a stepless General Electric Inductrol master switch, is first "pushed", to a creep-speed reference position.

At a preset distance, governed by a geared device, the master switch is pushed to the full-speed reference position. The rate limit regulator governs the rate of acceleration. Hydraulic units respond to electrical signals to push the master switch as described above.

At a preset distance from the end of travel, geared turn-off devices push the master switch to the creep-speed position. The rate regulator governs the rate of deceleration. After having reached reduced speed, the brakes are primed by a geared device set for distance and the skips engage the loading and unloading mechanism. Final stop is initiated by the previously mentioned magnetic limit switch.

If coal or rock is available, the skip at the loading pocket will move downward when loaded due to rope stretch. When this occurs, a second magnetic limit switch is caused to operate which energizes a timing relay. The resulting time delay allows complete emptying of the load pocket and the "up" skip. Following the time delay, the hoist automatically restarts and completes another cycle. In order to assure that motor torque is available, the brakes are released as a function of a torque (current) proving relay.

Safety Features

All of the standard safety features of automatic hoists are used at this installation. These include:

1. Synchronous motor thermal and instantaneous overcurrent, differential protection, current balance, field failure, and incomplete sequence protection.

2. Hoist motor overspeed, field loss, armature ground, overcurrent protection, and field economy (reduced field current at prolonged stand still).

3. Hoist generator overspeed, overvoltage, overcurrent, and ground protection.

4. Hoist overspeed and overtravel protection through a geared safety controller, track overtravel limit switches, and slack rope protection.

5. Control undervoltage and ground protection. Emergency stop pushbuttons are available at the console, main control panel, and underground control panel. Back out protection is available to assure proper torque and direction in the event an overtravel occurs.

In addition, there are two special safety features incorporated in the hoist control. One of these is "timed current" protection. This function performs in a limited way to monitor the time at which current in excess of that required for normal load is applied. The timer is set to start when current exceeds this value (normal load) and times out to stop the hoist if the higher current level is maintained longer than the normal acceleration time. Therefore, if the hoist is subjected to exceptionally heavy loads, or shaft obstructions stall the hoist, the hoist will be de-energized in a short time. The purpose of this feature is primarily to protect the drive equipment against sustained stalled current as well as to protect mechanical equipment.

The second special feature is a "speed check" function which backs up the safety controller. This function uses the speed-indicating tachometer, voltage relays, and magnetic switches to provide a one-point speed check during deceleration. The point checked is a distance from the end of travel where the skips should be down to 70% speed. If the hoist is not down to 70% speed or less at this point the system is emergency stopped. The circuitry is so arranged as to be self-checking on every trip and is fail safe. The distance selected for the speed checkpoint is such that the system can be stopped by the service brakes without going into overtravel if the skips pass the checkpoint at 100% speed.

A "fault indicator", or annunciator, made up of 27 neon tubes is mounted on the front of the hoist control panel. Each tube represents a safety device or function. When a fault occurs which stops the hoist, the fault

indicator shows which of the safety devices operated to shut the hoist down. The unit has memory and continues to indicate until the trouble is cleared and the indicator is reset.

Operating Experience

Prior to the new installation, the Federal No. 1 mine used a manual-balanced cylindriconical AC hoist and caged cars.

There is marked contrast in old and new operations. The usual advantages of using automatic systems are evident. That is, increased productivity, less downtime, fewer opportunities for human error, and consistent operation. The advantages of integrating this automatic equipment has also been evident. As mentioned before, each unit of the integrated system can be operated separately.

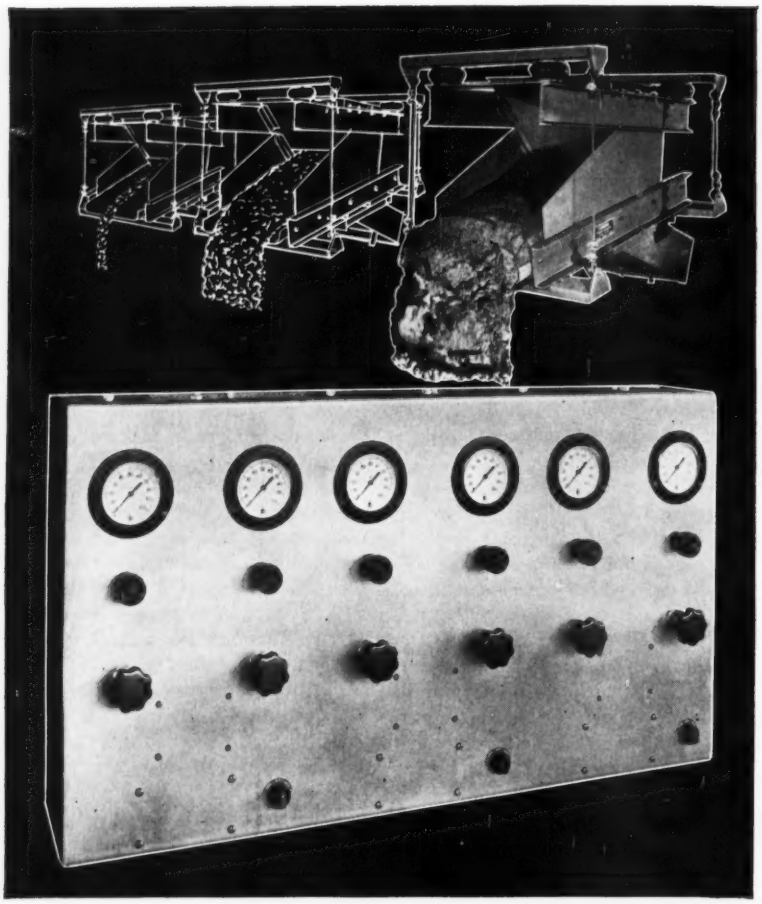
The Future

Although the EG&FA system does not include it, X-ray equipment may be incorporated into such a system to classify the contents of each car—either coal or rock—and route the load into the proper surface bin, thus providing complete automation of an integrated system. When automatic rail haulage becomes practical, an integrated automatic system can be used to move material from the face to the preparation plant.

The successful operation of the EG&FA automated-integrated system has caused other mining companies to consider and plan similar installations. It is apparent that such systems need not be limited to the coal industry. It is true that different techniques may be employed with different materials but the advantages of the philosophy of the integrated-automated system may be had by most mining operations using mine hoisting equipment.

Coming Next Month

Coal Age readers will receive their annual issue of the Mining Guidebook and Buying Directory in July. You will find this issue useful throughout the year as a reference book on up-to-date mining practices and equipment and as a source of information on names and locations of manufacturers. You will also get under the same cover the regular July issue of *Coal Age* with a full range of interesting feature articles, and regular news departments.



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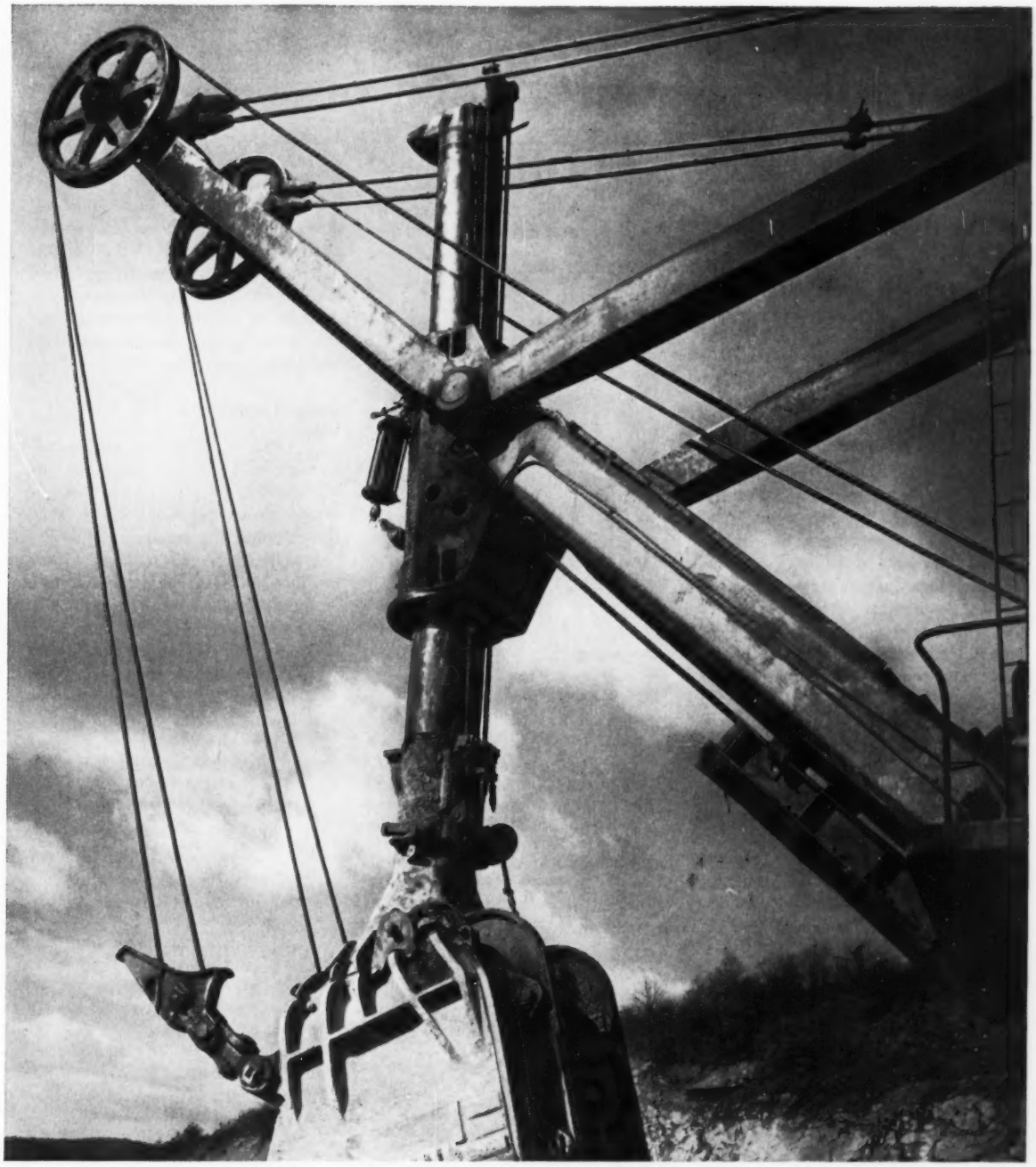

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Maintenance Ideas

Preventive Maintenance of Mercury-Arc Rectifiers

- Special Servicing
- Spring Servicing
- Fall Servicing
- Daily Inspection
- Weekly Inspection
- Yearly Servicing

Calvin H. Furfari
Consulting and Application Engineer
Westinghouse Electric Corp.
Pittsburgh, Pa.

RECTIFIERS FOR POWER CONVERSION have reached an exceptionally high degree of acceptance and popularity because of their many advantages over rotating equipment. Among these advantages is the fact that the ignitron rectifier requires little maintenance, thus provides low maintenance costs. With this inherent low maintenance factor, a regular preventive-maintenance program can assure many years of trouble-free service without electrical downtime due to rectifier failure.

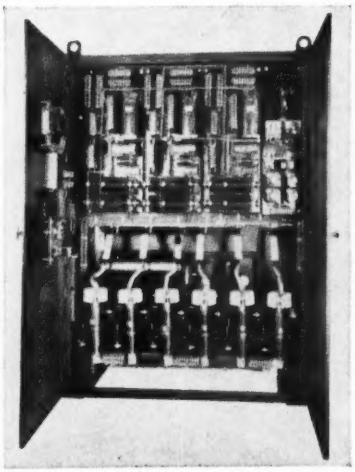
Control relays and control contractors are rugged and reliable but periodic inspection, cleaning and checking of the tightness of all connections is necessary. The inspection should be done by experienced personnel and should cover all the devices and connections.

Inspectors should be thoroughly instructed and experienced in both the function and adjustment on the various devices. They should have a uniform method of making inspections. Best results can be obtained by having a log covering points which need to be checked and reported at stated intervals. An excellent PM program can be set up on a daily, weekly and yearly schedule involving a minimum of time and expense.

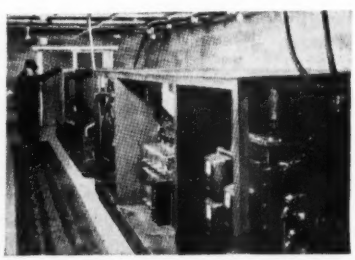
The inspection frequency is necessarily determined by the specific operating and atmospheric conditions. Among the causes of ignitron rectifier failure, neglect and abuse, and dust and moisture are some of the prime factors. Thus, special attention should be given to eliminating these factors.

As a word of caution, many of the exposed parts of a rectifier are live and dangerous. Do not work on live parts except in extreme emergencies. If work must be performed on live equipment, take every possible precaution to guard against accidents. Tools should be insulated. The use of rubber gloves and insulating mats are good safety habits.

When equipment is removed from service for inspection or maintenance, personnel doing the work should satisfy themselves that the circuits are dead before proceeding. They also should take the necessary precautions to see that the circuits cannot be energized unknowingly while they are working.



RUGGED AND RELIABLE RECTIFIER has largely replaced rotating conversion equipment since it requires less maintenance, but a good preventive-maintenance program is still essential for maximum operation.



DAILY SERVICING REQUIREMENT in a good preventive-maintenance program is a visual check of a few points to assure that the unit is operating.

Daily Inspection

1. Observe all of the misfire-indicating lights to see that they are all glowing steadily and that no noticeable change has occurred since the previous inspection.
2. Check the water level in the cooling system to be sure that it is well within the operating range as indicated on the sight or float gage.
3. Observe the temperature of the water discharged from the tubes by means of a thermometer in the top manifold.
4. Check the water pressure to see that it has not changed materially from the previous observance, either up or down.
5. Check the phase-shift current to see that it varies with the load current, thus giving an indication that the voltage regulator is operating.

Weekly Inspection

1. Blow out or preferably vacuum the equipment and give it a general cleaning.
2. Check the water system for any evidence of leaks.
3. On systems using a water-to-water heat exchanger operate the temperature regulating valve manually with the lifting fork provided to prevent sticking due to periods of constant load operation.
4. Check the condition and operation of the equipment in general.

Yearly Servicing

1. Vacuum or blow—with a hand bellows or blower—all dust from the equipment and wipe all insulators.
2. Inspect the contacts of all relays and contactors. Clean or replace any that require it.
3. Check all terminal connections for tightness.

Adapted from an article in Westinghouse *Maintenance News*

4. Wipe the AC and DC breakers clean. Inspect main and auxiliary contacts and check their operation manually and in the test position.

5. Megger the transformer windings for any reduction in the dielectric strength of the insulation. These readings, along with transformer temperature, should be listed in a permanent record to be used as a guide for subsequent readings.

6. Check the operation of all protective devices and the recloser to determine their ability to protect the rectifier against operation during abnormal conditions.

7. Check the operating points of the thermal and pressure switches and recalibrate them if required.

Special Servicing

Special servicing should be performed in the spring and fall of the year or as often as proves to be necessary by the operating conditions. Since these are special services it is extremely important to see that they are performed.

Spring Servicing

1. Drain the cooling system and flush with clear water.

2. Inspect the cooling system targets, strainer and piping.

3. Replace the targets if they are eroded, clean the strainer and repair any leaks in the piping.

4. Fill the system with clean distilled water and add a corrosion inhibitor consisting of 0.5% borax and 0.5% sodium dichromate by weight (0.7 oz each per gallon of water).

If the system shows signs of severe corrosion deposits and clogging, the following procedure should be used for flushing:

1. Drain the system and fill it with tap water approximately 95% of capacity.

2. Add any good commercial radiator flushing compound provided it contains an oxalic acid base. When using a commercial flush it is very important that the directions on the can are followed.

3. Circulate the compound for the required time per the directions.

4. Drain the system and refill it with tap water. Circulate the tap water for 15 min and then drain the system.

5. For pumped tubes refill the system with distilled water and add a corrosion inhibitor.

6. For sealed tubes the following additional procedure is necessary: Remove the tubes. Plug one water-connector nipple and fill with a 20% warm nitric acid solution through the other nipple. The nitric acid is intended to act as a passivating agent for the stainless steel water jacket.

7. When the tube is full the solution should be poured out immediately and replaced by a 50% solution of ammonium hydroxide (28% ammonia in water). The ammonia hydroxide solution should be left in the water jacket for 1 or 2 min.

8. After pouring the solution out, the tubes should be reconnected to the water system and the entire system filled with distilled water. The water should be circulated for about 15 min and drained. The system should then be filled with distilled water and rust inhibitor.

Fall Servicing

The first three steps of the fall-servicing program are the same as those required in the spring-servicing program. The fourth step differs in that the system is filled with clean distilled water and an anti-freeze added in installations where the water system may be subjected to sub-freezing temperatures. Add anti-freeze early enough to avoid freezing.

Special servicing of pumped-type units should include a cold seepage test yearly or whenever there is evidence of a vacuum system leak. The ignitor immersion also should be checked for proper depth.

After completion of the inspection and cleaning it is good practice to operate the protective devices manually by removing the equipment from service and allowing it to restart automatically. This insures that the equipment is left in operating condition, that the associated device contacts are clean and that any connections which may have been removed have been properly replaced.

It is advisable to maintain a permanent record of all device settings, the condition of the unit after each inspection and all equipment shutdowns. The record should show the reason for the shutdown, length of the outage and any work done during that period.

Where a specific preventive-maintenance program, as outlined in this feature, has been followed experience has proven that the effort more than pays for itself in reduced maintenance costs, and more important, in reduced outage time and production loss.

Glossary of Electrical Terms

FOR THE CORRECT DEFINITION of electrical terms used to discuss the function, operation and maintenance of rectifiers check the following list to make sure that your definition is right. They have been approved by American Standards Association, Bulletin C42.15, published by American Institute of Electrical Engineers.

Rectification—This term is used to designate the process by which electrical energy is transferred from an AC circuit to a DC circuit.

Rectifying Device—A rectifying device is an elementary device consisting of one anode and its cathode which has the characteristic of conducting current effectively in only one direction.

Rectifier—A rectifier is an integral assembly of one or more rectifying devices.

Rectifier Unit—A unit is an operative assembly consisting of the rectifier, or rectifiers, together with the rectifier auxiliaries, the rectifier transformer equipment and the essential switchgear.

Rectifier Circuit Element—This element has the characteristic of conducting current substantially in one direction only.

Note 1: A rectifying circuit element

may consist of a group of rectifying devices or metallic rectifying cells connected in series or parallel, or both, to operate as a unit.

Note 2: The contacts of mechanical rectifiers together with commutating reactors or other commutation aids used in mechanical rectifier circuits are rectifying elements.

Section of Rectifier Unit—A section of a rectifier unit is a part of a rectifier unit with its auxiliaries which may be operated independently.

Mercury-Arc Rectifier—This is a rectifier consisting of one or more mercury-vapor gas tubes.

Controlled Rectifier—A rectifier in which means for controlling the current flow through the rectifying devices is provided.

Rectifier Anode—This is an electrode of the rectifier from which the current flows into the arc.

Note: The direction of current flow is considered in the conventional sense from positive to negative. The cathode is the positive DC terminal of the apparatus and is usually a pool of mercury. The neutral of the transformer secondary system is the negative DC terminal of the rectifier unit.

Starting Anode — An electrode which is used in establishing the initial arc.

Excitation Anode — An electrode which is used to maintain an auxiliary arc in the vacuum tank.

Rectifier Cathode—This is an electrode of the rectifier into which the current flows from the arc.

Note: The direction of current flow is considered in the conventional sense from positive to negative. The cathode is the positive DC terminal of the rectifier unit and is usually a pool of mercury. The neutral of the transformer secondary system is the negative DC terminal of the rectifier unit.

Grids—Grids are electrodes which are placed in the arc stream and to which a control voltage may be applied.

Temperature-Regulating Equipment—Any equipment used for heating and cooling the rectifier together with the devices for controlling and indicating its temperature.

Cooling System of a Rectifier—The cooling system of a rectifier is the equipment, i. e., parts and their interconnections, used for cooling a rectifier. It includes all or some of the following: rectifier water jacket, cooling coils or fins, heat exchanger, blower, water pump, expansion tank, insulating pipes, etc.

Direct-Raw-Water Cooling System—A cooling system in which water, received from a constantly available supply, such as a well or water system is passed directly over the cooling surfaces of the rectifier and discharged.

Single-Way Rectifier Circuit—A circuit in which the current between each terminal of the alternating-voltage circuit and the rectifying element conductively connected to it flows in both directions.

Note: The term single-way and double-way provide a means for describing the effect of the circuit on current flow in transformer windings. Most rectifier circuits may be classified into two general types. In practice a rectifier circuit is assumed to be single-way unless it is specifically stated as double-way.

Rating of a Rectifier Unit—The rating is the kilowatt power output, voltages, currents, number of phases, frequency, amount of phase control, etc., assigned to it by the manufacturer.

Continuous Rating — This defines the maximum load which can be carried continuously without exceeding established temperature rise limitations under prescribed conditions of test and within the limitations of established standards.

Short-Time Rating — This defines the maximum load which can be carried for a specified short time without exceeding the specified temperature rise limitations under prescribed conditions of test and within the limitations of established standards.

Note: The short-time rating includes loads of 2-hr duration.

Rated Load—This is the kilowatt power output which can be delivered continuously at the rated output voltage. It may also be designated as the 100% load or full-load rating of the unit.

Note: Where the rating of a rectifier unit does not designate a continuous load it is considered special.

Rated Output Voltage—The current specified as the basis of rating.

Rated Output Current—The current derived from the rated load and the rated output voltage.

Arc-Back—An arc-back is a failure of the rectifying action which results in the flow of a principal electron stream in the reverse direction due to the formation of cathode spot on an anode.

Arc-Through—An arc-through is a loss of control resulting in the flow of a principal electron stream through the rectifying element in the normal direction during a scheduled non-conduction period.

Misfire—A misfire is a failure to establish an arc between the main anode and cathode during a scheduled conducting period.

Full-Wave Rectifier — A rectifier which changes single-phase alternating current into pulsating unidirectional current, utilizing both halves of each cycle.

Half-Wave Rectifier — A rectifier which changes single-phase alternating current into pulsating unidirectional current, utilizing only one-half of each cycle.

Diametric Rectifier Circuit—A circuit which employs two or more rectifying elements with a conducting period of 180 electrical degrees, plus the commutating angle.

Wye Rectifier Circuit—A circuit which employes three or more rectifying elements with a conducting period of 120 electrical degrees, plus the commutating angle.

Star Rectifier Circuit — A circuit which employs six or more rectifying elements with a conducting period of 60 electrical degrees plus the commutating angle.

Power Factor—This is the ratio of the total watts input to the total rms volt-ampere input to the rectifier or rectifier unit.

Voltage Regulation – This is the change in output voltage which occurs when the load is reduced from rated value to zero with the values of all other quantities remaining unchanged.

Note: The regulation may be expressed in per unit or percentage on the base of rated output voltage at full load.

Ripple Voltage – The alternating component of a substantially unidirectional voltage.

Percent Ripple Voltage–The ratio in percent of the effective (root-mean-square) value of the ripple voltage in the pulsating voltage to the average value of the pulsating voltage.

Phase Control – The process of varying the point within the cycle at which anode conduction is permitted to begin.

Note: Phase control may be effected by means of grids which control the time at which an anode may pick up current or by means of ignitors which control the time of starting the cathode spot on the mercury pool.

The amount of phase control may be expressed in two ways: (1) the reduction in direct potential obtained by phase control or (2) the angle of phase retard or advance.

Number of Rectifier Phases – A rectifier circuit is equal to the total number of successive, non-simultaneous commutations occurring within that rectifier circuit during each cycle when operating without phase control. It is also equal to the order of the principal harmonic in the direct-current potential wave shape.

Note: The number of rectifier phases influence both AC and DC wave form. In a simple single-way rectifier the number of rectifier phases is equal to the number of rectifying elements.

Excitation Equipment–The equipment used for starting, maintaining and controlling the arc.

Efficiency of a Rectifier–The ratio of the power output to the total power input.

How to Make Good Electrical Connections

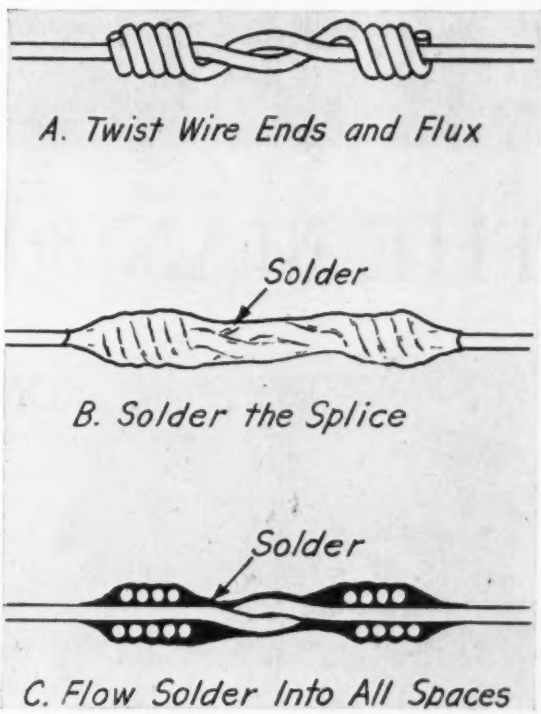
ADEQUATE AND WELL-INSULATED ELECTRICAL SYSTEMS are mandatory for safety. It takes only one poor connection to turn a normally safe system into a hazard according to *Linde Tips*, published by The Linde Co., Division of Union Carbide Corp. To guard against electrical mishaps a Prest-O-Lite air-acetylene torch can be used to solder copper wires, attach lugs and clips and make permanent, safe connections that will assure you of good electrical contact.

Here are a few hints for making good, safe electrical connections.

To repair lugs and clips first scrape or sandpaper the wire ends until the copper is shiny. Then clean the inside of the lug or contact part of the clip. Now apply a noncorrosive paste flux to both parts. If the terminal connection sleeve is more than ¼-in deep, coat or tin the inside of the sleeve and the wire with solder. Force these together and "sweat" them so that they form a tight joint. For additional safety be sure the sleeve is completely filled with solder.

Connections with short sleeves are similarly prepared except that you pinch the sleeve over the wire end and fill the open end with solder.

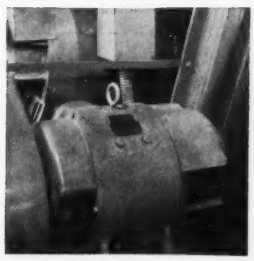
If terminal clips are missing cut the insulation away from the wire end. Then use a pair of round nose pliers to bend the wire into a loop and solder the end of the loop to keep it from opening. If you are using stranded wire place a small drop of solder on the wire end so it will not unravel.



THREE STEPS to a good wire splice.

You can make a good splice in copper wire by using soft solder to solidify the connection. Again, clean the wire ends until they shine. Twist them together as shown in the accompanying illustration. Next, flux the entire joint, heat and flow solder into all the spaces. This will assure a good electrical contact and a strong, permanent connection.

THE MAN & THE MOTORS



Mr. Westinghouse* and dependable d-c motors help Marriott-Reed move up to 18,000 cubic yards of overburden every 24 hours

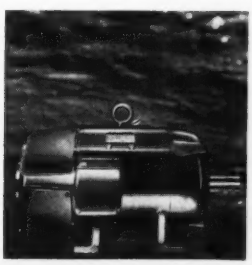
Westinghouse motors totaling 312 peak hp swing the big 360-ton, 12-cubic-yard drag line day after day with little maintenance or down time.

Superintendent J. E. Linn, Marriott-Reed Coal Company, Columbia, Missouri, says: "We have been using Westinghouse motors in our mining operation since I began working for A. E. Marriott back in 1926. There is no question but that they are rugged and dependable."

Mr. Westinghouse can help *you* solve any drive problem, too . . . with the correct motor for the job.

**Clyde Kennett, St. Louis, Missouri office*

FROM WESTINGHOUSE



Rugged d-c motors and Mr. Westinghouse† helped Omar Mining Company reduce costly down time

More than 100 motors, ranging from 5 hp to 150 hp, are used at Omar's No. 15 Mine to assure continuous output from three coal conveyors. Three 25-hp motors drive the vital Long-Airdox conveyors from one mining area to another. Costly down time is reduced because these Westinghouse motors are designed for maximum stamina in armature and commutator, local heating is prevented by controlled ventilation, and their factory packed bearings need no lubrication.

†*I. M. Rowe, Charleston, West Virginia office*

Call in The Man from Westinghouse when you need help with your electrical drive or related control requirements. He's well equipped to supply motors from fractional hp to hundreds of "horses." He'll show you how to save money . . . whether it's a shelf item or a custom-engineered job. For additional information write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-22159

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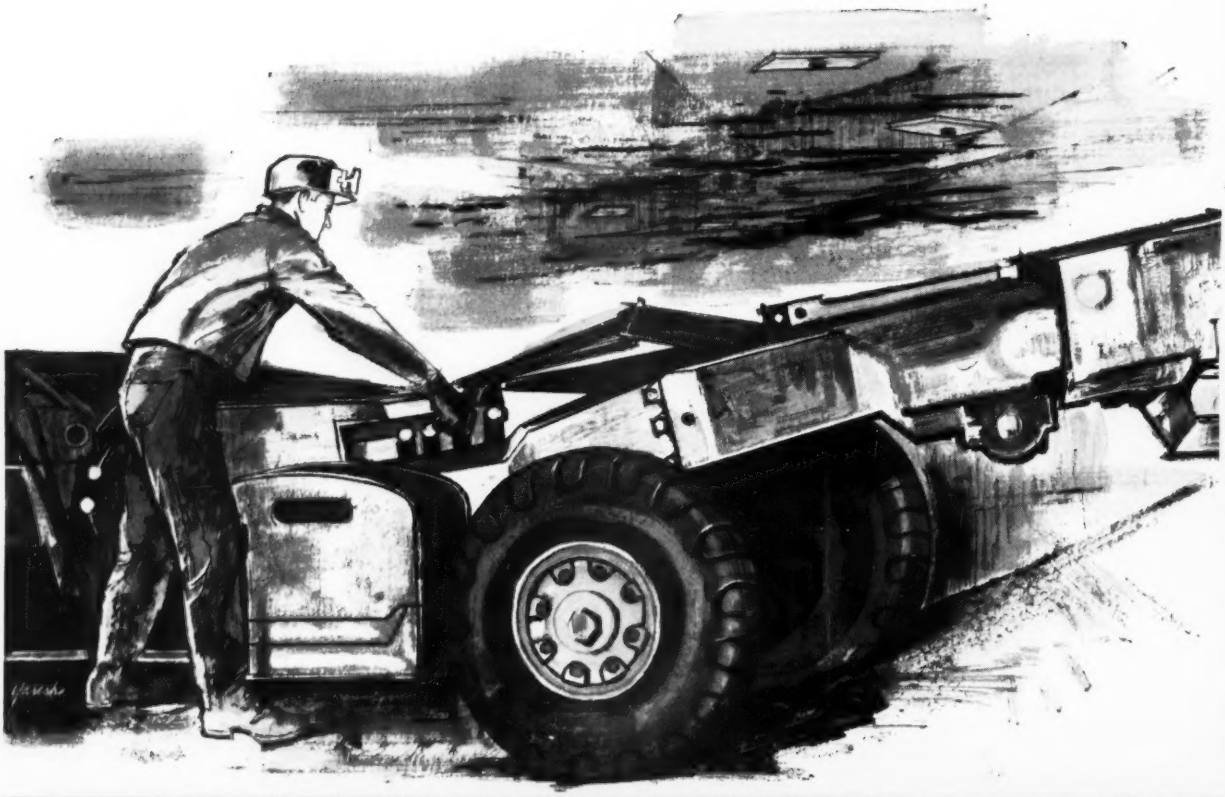
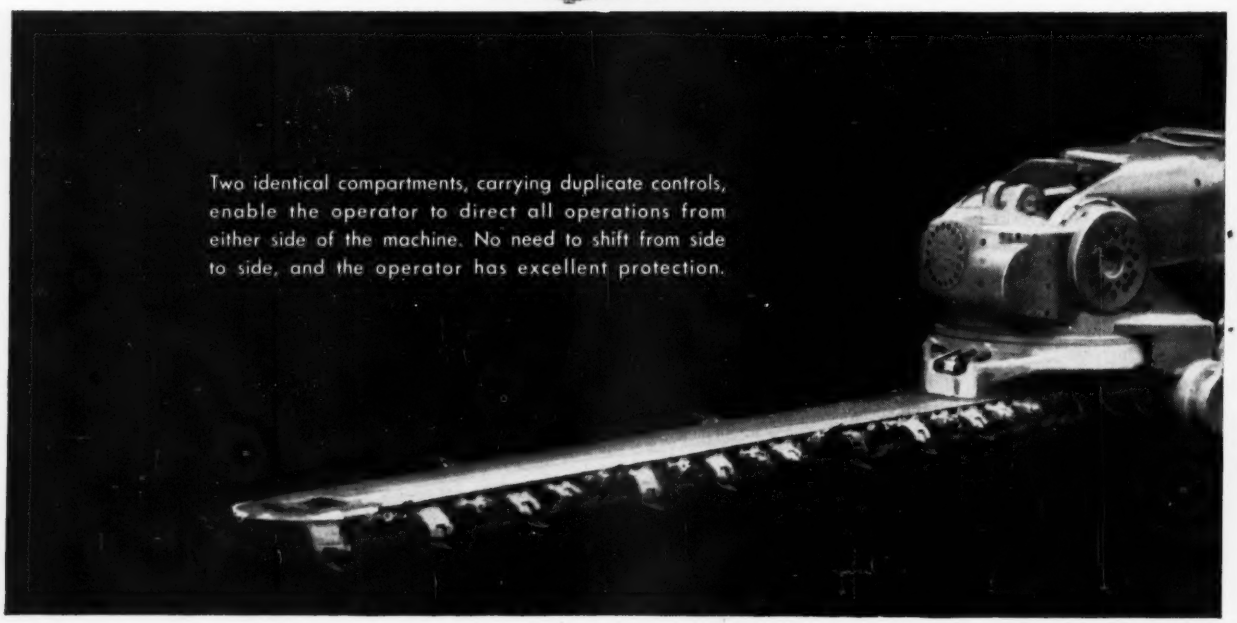
TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

JEFFREY UNIVERSAL COAL CUTTERS . . .



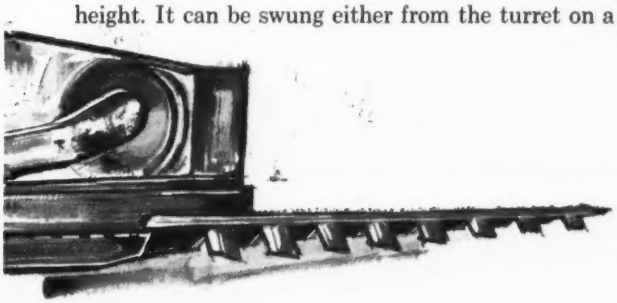


Two identical compartments, carrying duplicate controls, enable the operator to direct all operations from either side of the machine. No need to shift from side to side, and the operator has excellent protection.

cut any place in the seam from 14" below floor level to 13' above

Jeffrey Universal Coal Cutters (AC or DC) are designed to meet various mine conditions and are available for working in mines with seam heights ranging from three feet to thirteen feet.

Jeffrey cutting machines mounted on rubber tires have a cutting head which can rotate and is instantly adjustable in height. It can be swung either from the turret on a long radius



or from the cutter head on a shorter radius. This permits bottom or top cutting any place in the seam or for making a shear cut right or left of center.

These machines feature the latest developments in coal cutting efficiency to give more workability without breakdowns... important advantages in getting higher production.

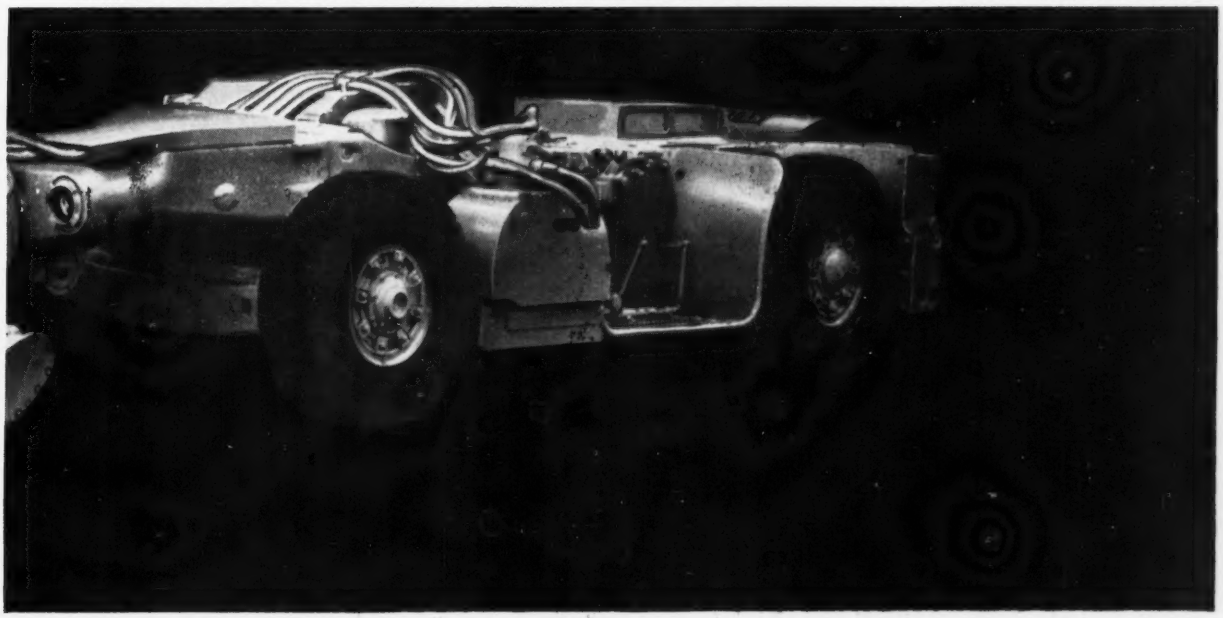
ADVANTAGES

1. Full hydraulic control of all operations except cutter chain drive
2. Easy to operate and control—giving quick response from finger-tip controls
3. Built for safety and speed
4. Designed for hard cutting
5. Constructed to stand up under rugged going
6. Have maximum flexibility and low cost operation—no operating time wasted
7. More smooth cuts per shift
8. Operating and control mechanisms are accessible for maintenance

JEFFREY

THE JEFFREY MANUFACTURING COMPANY
912 North Fourth Street
Columbus 16, Ohio

MINING • CONVEYING • PROCESSING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING



Utilization, Mining and Maintenance

Coal use in the future, continuous drilling and shooting, hydraulic mining, mechanized track tamping, continuous-miner maintenance and flame-spray metal application feature Mont Chateau sessions.

COAL MARKETS—William O. Barnard, Christopher Coal Co., co-chairman; E. C. Withers, Monongahela Power Co.; George C. McCaa, Ireland Mine, Hanna Coal Co., chairman; George A. Lamb, Consolidation Coal Co.

COAL UTILIZATION mining and equipment maintenance were the themes of the 1960 spring meeting of the West Virginia Coal Mining Institute, Mont Chateau Lodge, Morgantown, W. Va., April 22-23. In addition to the three technical sessions, Stephen F. Dunn, president, National Coal Association, was guest speaker at the institute luncheon April 22, discussing the new organizational setup of NCA, and emphasizing "Coal's Goals," including building public goodwill, eliminating unfair competition from dumped imported residual and natural gas, and the stimulation of research, with the overall objective of increasing coal sales and getting a fair return on investment. C. R. Nailler, president, Christopher Coal Co., Morgantown, presided. At the institute dinner, with S. Dunlap Brady Jr., Baltimore & Ohio R.R., coal department, Summersville, W. Va., presiding, the guest speaker was Dr. Perry E. Gresham, president, Bethany (W. Va.) College.

Utilization Session

Chairman—George W. McCaa, gengeneral superintendent, Hanna Coal Co., Moundsville, W. Va.

Co-Chairman—William O. Barnard, general superintendent, Christopher Coal Co., Morgantown, W. Va.

The Utilities' Stake in the Coal Business, E. C. Withers, treasurer, Monongahela Power Co., Fairmont, W. Va.

Some 30 yr ago, the big markets of Monongahela Power were street cars and coal mines. The latter are still here and now take 15% of kwhr sales and contribute 12½% of revenues. In 1959 sales to coal totalled $4,800,000; purchases of coal, $5,500,000. Ten years ago the company burned 600,000 tons. In 1959 the burn was 1,498,000 tons.

The utilities look forward to major growth if they are successful in solving their problems. By 1970 kwhr sales (625 billion in 1959) should reach 1,500 billion. If coal's percentage stayed at 68, the industry would need 240 million more tons. If coal got it all, the increase would be 360 million, divided as follows: residual, 110 million increase; commercial, 60 million; industrial, 170 million. The big opportunity ahead is electric heating, but gains will come all along the line, in spite of intensified competition by gas and oil and continued pressure for government hydro paralleled

COAL'S GOALS—Stephen F. Dunn, president, National Coal Association; C. R. Nailler, Christopher Coal Co.; S. Dunlap Brady Jr., Baltimore & Ohio R. R., and institute president.

MACHINE MAINTENANCE—Frank Gaddy, Chesapeake & Ohio Ry., chairman; S. K. Sturm, Metallizing Engineering Co.; Joseph Mason, Mountaineer Coal Co.

Canvassed at West Virginia Meeting

MINING METHODS—Robert J. Shiel, Hercules Powder Co.; W. E. Edmunds, Baton Coal Co., chairman; William Laird, Eastern Gas & Fuel Associates, co-chairman; D. H. Davis, Consolidation Coal Co.; George Price, USBM.

by continued pressure for public power facilities of all types, which are direct competitors of coal or private utilities, or both.

Five key factors in progress in promoting electricity and coal use are:

Greater stress on more efficient coal production, preparation and utilization.

A resolve to meet gas and oil competition squarely.

Hard and effective work to combat the creeping socialism of government power.

A solution of the coal and electricity transportation problems for lowered delivered prices.

All available pressure behind the "coal-by-wire" concept.

Coal's Future Market, G. A. Lamb, manager of market surveys, Consolidation Coal Co., Pittsburgh, Pa.

A number of long-range forecasts for coal have been made in recent years ranging widely in total from, say, a low of 600 million in 1975 to a high of 900, with 700 to 850 million as the intermediate figure. The variations arise primarily from different ideas as to utility-fuel, coke and other rates in future years, as well as declines in certain markets and rises in others. In any event, coal is scheduled for a good future as a result of growth in population, industrial production and energy demand – this in spite of some forecasts of a growth of up to 75% or more in oil and gas contributions combined, and also taking into account nuclear development after about 1970.

The more-conservative group puts demand at 600 million in 1975 and 750 in 1980. Growth inevitably will take place because coal has the reserves and can specialize in serving the main market of the future: the utilities. Neither oil nor gas can specialize in this market and make any money. Finally, coal can—as it has—keep its prices down. For these and other reasons, coal has a possibility of a total market of 400 million tons in the utility field in 1975, against 50 million (coal equivalent) for nuclear and 137 million for all other fuels—at a fuel rate for all of 0.65 lb per kwhr. In addition to the utilities, more than 200 million will be required by steel in 1975, etc.

Fine, but when does growth start? The answer is that it already would have been noticeable except for residual import and dumping along the Atlantic Coast and the dumping of natural gas in inland areas. Consequently, it may be 2 or 3 yr or more before the upward trend begins, but when it does it should go rapidly.

Mining Session

Chairman—W. E. Edmunds, general superintendent, Baton Coal Co., Pittsburgh, Pa.

Co-chairman—William Laird, superintendent, Federal No. 1 mine, Eastern Gas & Fuel Associates, Grant Town, W. Va.

Development of Continuous Drilling and Shooting of Coal, Robert J. Shiel, technical representative, Hercules Powder Co., Pittsburgh, Pa.

Development of the idea of breaking coal through gases passed through a rotating drill operating in conjunction with a continuous mining unit has recently been undertaken at properties of the Compass Coal Co., in northern West Virginia by Hercules in cooperation with the BCR Mining Development Committee. Known as the Hercules "Gun Drill" or "Jet Miner," the unit being employed is based on the British "Cobra" tube, involving a combustion chamber outside and a breaking tube in the coal. The tube in the present program is replaced with the drill stem with ports just back or the bits. A chemical charge with igniter supplies the gases and a rupturing disc accomplishes the discharge.

The latest unit comprises a Jeffrey Konnerth 34F miner, loaned by U. S. Steel, on which the gun drill is mounted. Using the miner the coal is first undercut, then sheared on two sides to make a block 6 ft high and 7 ft wide. It is then drilled 3 ft deep and broken by gas released through the auger from the combustion chamber. Places are driven 15 ft wide.

On the basis of experience to date, there appear to be three possible favorable applications of the idea:

1. Use with a continuous-type machine, such as a modified 34F.
2. Use for drilling and shooting in one operation in a conventional setup, thus eliminating the charging step.
3. Use on a loading machine with all other cycle elements, including cutting, retained and with the loader operator handling drilling and shooting.

Research in Hydraulic Mining, motion picture with narration by George Price, U. S. Bureau of Mines, Pittsburgh, Pa.

Discussion of the results attained in the first experiments in hydraulic mining of coal near Indiana, Pa. These experiments will be continued.

Mechanized Tamping of Mine Haulage Roads, D. H. Davis, assistant to the vice president, Consolidation Coal Co., Pittsburgh, Pa.

Application of ballast and its tamping is an example of the real gains that can be made by mechanizing construction and maintenance. At Mathies mine, where tonnage is high and a double main line is employed tracklaying is a major operation. This led to research into means of cutting the initial cost as well as reducing maintenance. Boreholes and bins for handling ballast and special cars for transport and spreading were among the steps taken. But tamping properly, with ballast under the tie and properly packed under the rail, was slow and costly.

(*Continued*)

Study of the problem and consultation with manufacturers led to the development of the Fletcher tie tamper. Now, with coarse ballast, two men can properly tamp over 600 ft of track in a shift. By hand, five men using jacks and individual pneumatic equipment, could do only 100 ft in a shift. Aside from new construction, the unit provides equal benefits in track repair.

Maintenance Session

Chairman—Frank Gaddy, mining engineer, Chesapeake & Ohio Ry., Huntington, W. Va.

Daily Maintenance and Overhaul of Continuous Miners, Joseph Mason, maintenance superintendent, Mountaineer Coal Co., Fairmont, W. Va.

"The basic problem in the maintenance of the miner is centered around the complexity of the machine. It is simply too complex for our Jack-of-all-trades mechanic. The transition from conventional to continuous mining has taken place so rapidly that the mine mechanic has been unable to keep pace." He is forced to play it by ear, which is expensive.

"There is a shortage of men skilled enough in the class of work required in the maintenance of these complex machines. What's the answer? Better-trained men, better maintenance instruction, better field service? These are all good measures, but the real cure is to provide for the man down at the 'do-it' level.

"Since the miner, viewed as a whole, is admittedly too complex for the jack-of-all-trades mechanic, it is broken down into its component parts and thus becomes easy to understand. The continuous miner is simply a combination of mechanical, electrical and hydraulic components. In organizing and executing the maintenance program each of these three components is treated as a system. Once the program has been broken down into this simple form definite policies and procedures can be established to insure effective maintenance. The selection, training and placement of mechanics and technicians become more effective.

"To further assist the maintenance man to do his job better, quicker and easier, adequate service facilities are provided. Adequate service facilities are those required to promote the six basic functions of checking, servicing, adjusting, repairing, replacing and trouble-shooting. Visual indicators, test-facilities and other devices are installed as an integral part of the machine to provide for fast and efficient applications of lubricants, to provide instrument-panel-type daily inspection with minimum interruption in production and to replace the expensive trial-and-error method of hydraulic and electrical trouble-shooting."

Flame-Spray Process—Its Practical Applications, S. K. Sturm, field engineer, Metallizing Engineering Co., Pittsburgh, Pa.

Flame spraying of metal helps in maintenance and cost reduction basically by making possible salvage of parts at low-cost, and also by making parts more efficient and longer lasting. The three types of processes now available are metallizing, involving melting of wire of the desired characteristics in a flame and blowing it onto the part by compressed air; Thermospray, or the blowing of powdered metals and other materials on the part or surface; and Plasmaflame, an extremely high-temperature new process permitting application of metals and materials hitherto difficult to handle, as well as materials previously used in the other processes.

Advantages provided by the three processes include ability to salvage parts and units at low cost compared to purchasing new; increased ability of parts and components to resist wear, abrasion and corrosion; a reduction in the inventory of parts and components susceptible to flame-spray treatment; and a reduction in machine downtime because of improved elements.

YOU GET GENUINE JOY PARTS FASTER with this new RAMAC electronic inventory control system. It locates parts immediately, in any of Joy's 11 parts warehouses. Joy's trucks speed the parts from the nearest warehouse to your door when you need them. Always specify genuine Joy parts.

GENUINE JOY PARTS AVAILABLE AT 11 LOCATIONS:

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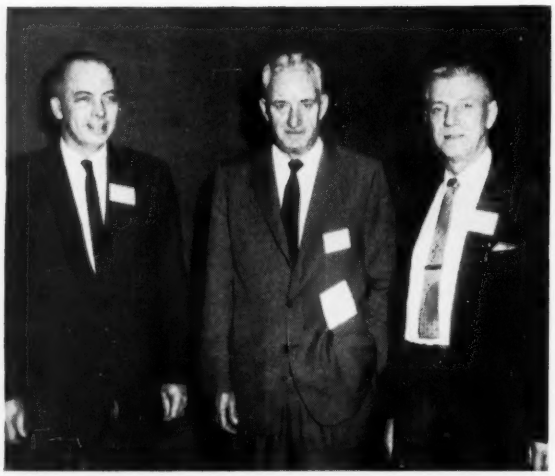
STRIPPING, CONTINUOUS MINING, COMMUNICATIONS —Dick Knobloch, U. S. Rubber Co.; John A. Stachura, Enoco Collieries, Inc.; and R. C. Milholland, Bucyrus-Erie Co.



AC POWER, MINE FIRES, MECHANIZED TIE TAMPING —D. H. Davis (left), Consolidation Coal Co.; L. E. Briscoe, Ayrshire Collieries Corp.; and Frank Kolisek, Freeman Coal.

Wide Range Covered At Indiana Meeting

A LOOK at a range of the direct mining processes and service operations featured the 1960 meeting of the Indiana Coal Mining Institute, held at the Hotel Deming, Terre Haute, Ind., April 30. Two technical sessions were climaxed by the annual dinner with Howard T. Batman, manager and general counsel, Lynch Coal Operators' Reciprocal Association, presiding. Topics at the technical sessions, with E. M. Cassidy, retiring institute president presiding, were as follows:

Thunderbird Mine AC Power Distribution (slide presentation), L. E. Briscoe, electrical engineer, Ayrshire Collieries Corp., Indianapolis, Ind.—The Thunderbird system is "the safest system that has ever been built." In addition, it is designed to enhance the other operating benefits accruing from the use of AC. Duplicate transformers supply surface and underground loads, with primary distribution to the preparation plant and other surface facilities through buried cable. Underground circuits start out as overhead lines to boreholes feeding a cable system underground.

Power is purchased at 67,000 V and reduced to 4,160 nominal for distribution, with service transformers for the final 440-V step. Voltage regulation is less than 10% underground at the end of 6,000 ft of 4/0 cable. Complete protection includes lightning arresters and ground protection. Main haulage is by belt, and battery-powered jeeps are used to move employees, equipment and materials.

OLD AND NEW OFFICERS— E. M. Cassidy, assistant to the vice president and general manager, Snow Hill Coal Corp., and retiring institute president (left), poses with Miss Ethel Morgan, re-elected secretary-treasurer, and the new institute president, Ralph Whitman, superintendent, Ingle Coal Co.

Recent Fires at Crown Mine, Frank Kolisek, safety director, Freeman Coal Mining Corp., Benton, Ill.—Six fires in the last 6 or 7 yr represents "more than our share," even though two were of electrical origin. A complicating factor is the fact that the coal at the mine will ignite spontaneously. This, plus the fact that the roof is very bad and must be taken down and gobbed in special gob rooms underground to reduce the cost of taking the material outside, led to considerable trouble when the gob rooms were between headings. As a result they were made a part of the room panel and the panel system was modified to permit completion and sealing in not over 5 to 6 mo, which experience showed would permit the sealing before a fire normally would start. Immediately before sealing top material and falls from the main entries are loaded and moved into the panels.

Fires in room panels were thus taken care of, but then the four mainline fires

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were encountered. Because of the heavy caving pinpointing the origin was difficult even after the odor gave warning that the fire was there. And even though the coal can ignite spontaneously the source in the mainline blazes was an oily shale over the top coal. Once pinpointed, the fallen material and the fire was loaded out and hoisted for disposal. High ribs and the possibility of sloughing, as well as smoke preventing roof observation, are the chief hazards, although only one injury has been incurred. Since the main openings cannot be sealed the aim must be preventing ignition, but it is a difficult problem.

Mechanized Tamping of Mine Haulage Roads, D. H. Davis, assistant to the vice president–operations, Consolidation Coal Co., Pittsburgh, Pa.–See p 123 of this issue of *Coal Age*.

Progress in the Development of Larger Stripping Machines (motion pictures), R. C. Milholland, sales representative, Bucyrus-Erie Co., Evansville, Ind. Increased overburden-to-coal ratios have forced the development of larger, faster and higher-capacity stripping units. Some 25 yr ago, with 10 to 50 ft of burden and a maximum ratio of 10:1, a yardage of 250,000 per mo meant an impressive shovel. Now 75 to 100 ft is common, along with 2 to 3 million yd per mo.

Until the 3850B, designed to handle dippers from 100 to 130 yd, dipper sizes progressed in almost a straight line from 12 to 16 yd for the 750B in 1927 to 50 to 65 yd for the 1650B in 1957. The 3850B, along with increased dipper capacity, also has the ability to strip overburdens 30 to 50% deeper.

Draglines have shown a similar growth, with 45 yd now the maximum bucket size and booms up to 300 ft in length. The most recent development is the wheel excavator–a high output machine permitting a major increase in shovel efficiency in a tandem operation.

Indiana Officers

President—Ralph Whitman, superintendent, Ingle Coal Co., Elberfeld, Ind., succeeding E. M. Cassidy, assistant to the vice president and general manager, Snow Hill Coal Corp., Terre Haute, Ind.

Vice Presidents — Michael Kensek, safety director, Enoco Collieries, Inc.; W. A. Endicott, general superintendent, Ayrshire Collieries Corp.; Ray Biggs, chief electrician, Viking Coal Corp.

Secretary-Treasurer — Miss Ethel Morgan.

Executive Board — Reuben Tucker, Thunderbird Collieries Corp.; C. M. Hodgson, Mine Safety Appliances Co.; H. P. Roberts, C. F. Gharst Supply Co.; Charles Adams, Kennametal, Inc.; Nathaniel Kirk, Snow Hill Coal Corp.; George Stachura, Pandora Coal Co.; Carl Donie, Fairview Collieries Corp.; E. M. Cassidy, Snow Hill Coal Corp.

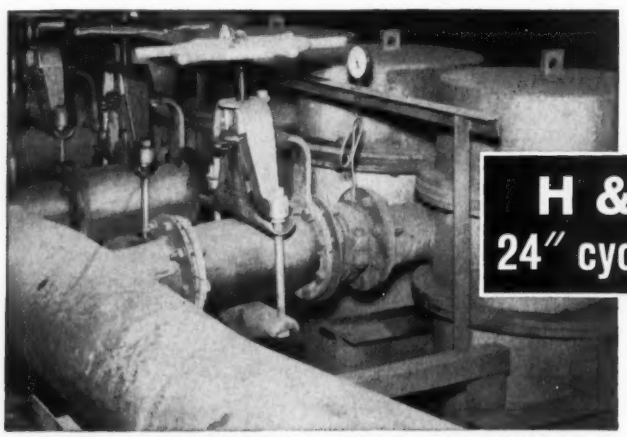
Selecting a Continuous Miner, John A. Stachura, vice president, Enoco Collieries, Inc., Bruceville, Ind.–"In most mining operations there is a tremendous incentive to undertake continuous mining. It can reduce the size of the mine greatly by permitting a minimum of working places. It makes pillar work more efficient from the standpoint of overall cost, amount of coal recovered and safety. The work force can be reduced materially, permitting closer and more-efficient supervision. Maintenance is simplified because equipment can be more readily standardized.

"The trend of the coal market favors the use of continuous mining machines." Those who have not yet undertaken continuous mining have not done so for one or more of the following reasons:

1. Coal-seam thickness.
2. Seam characteristics.
3. Soft bottom.
4. Bad roof.
5. More fines in the product.
6. Insufficient flexibility in machines.
7. Difficult ventilation problems.
8. High maintenance costs.

New machine designs, however, meet most of these objections, if not all. Better machine design is alleviating the maintenance problem, with the result that some machines have produced over a million tons without a major overhaul. Increased production of fines must be expected–at least under some conditions–and preparation set up accordingly. Some progress has been made in roof control but a satisfactory solution is yet to be reached. But "I feel certain that there is a machine available today to suit most mining conditions, and I am sure that in the near future there will be one for all mines capable of using mechanical equipment. This program can provide us with the equipment and the mining methods to greatly improve our overall production and safety records in deep mining."

Communications (Champion Paper & Fibre Co. movie entitled "Production 5118" and dealing with the problems, techniques and objectives of effective personal and corporate communication), Dick Knobloch, sales representative, U. S. Rubber Co., Terre Haute.



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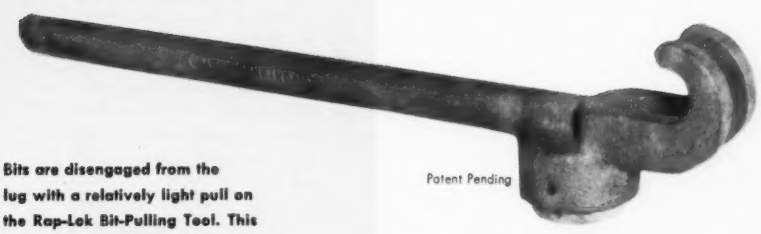

Patent Pending

Bits are disengaged from the lug with a relatively light pull on the Rap-Lok Bit-Pulling Tool. This saves time and effort. The long-lasting hammer face is easily renewable.

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AMC Pittsburgh Coal Convention Themes:

Automation Boosts Efficiency, Maintenance Keeps It High

GIANT STEPS in preparation-plant automation, still-growing emphasis on maintenance engineering, coal's achievements and goals in personnel programs and the industry's role in national affairs were among important subjects presented by speakers at the American Mining Congress Coal Convention at Pittsburgh, May 8-11. Opening session was devoted to an analysis of coal's position in support of a national fuels policy, followed by technical sessions on deep mining, stripping, coal preparation, electric power and stream pollution. Abstracts of the proceedings follow:

Coal and the Future

Opening Remarks, Raymond E. Salvati, president, American Mining Congress.

Most of us are highly optimistic that the decade of the sixties will bring about increasing demands for coal. Conservative estimates place the annual consumption of coal in this country by 1970 at 600 to 700 million tons. I'd like to interject a word of caution here. During this period a large percentage—some 100 million tons—of today's available mine capacity will approach exhaustion. We shall not only have to replace this capacity, but will also have to provide new capacity of some 100 million tons to meet the projected demand for coal.

Meeting this goal will require huge capital outlays and ever increasing attention to ways of obtaining more efficient production. The mining equipment manufacturers—many of whom are here this morning—must continue to help modernize and automate our industry. Their splendid cooperation in the past has contributed greatly to our success in raising average daily output from six tons per man in 1948 to more than 12 tons per man in 1959—a figure which we expect to be substantially higher in 1970.

While we are optimistic about the future of the coal industry, that future depends to a great extent upon the wisest possible use of all our Nation's energy resources—including the maintenance of a strong, stable domestic energy base. This, we believe, requires the formulation of a constructive national fuels policy which will be the subject of the following talks.

National Fuels Policy

Hon. Elmer F. Bennett, Under Secretary of the Interior (presented by Royce A. Hardy, assistant secretary).

Aims of a fuel policy should be (1) to assure an abundant supply of economical energy, (2) to foster healthy and vigorous competition between the various fuels, and (3) to set up a system of rules and regulations which together assure that the competition between fuels is conducted according to prescribed ground rules, or, as we might say, rules of fair play.

So far as the Department that I represent is concerned, we will continue to foster the development of all fuels. We are convinced that only in this way will the full potential of our immense energy-consuming economy be realized. At the same time, we pledge to you that we will take the initiative in assisting in the development of new rules as the need arises, and will be in the forefront in forcibly bringing to the attention of the responsible agencies any instance that comes to our attention in which these rules are not fully observed.

Hon. Wayne N. Aspinwall, U. S. Representative, Colorado; chairman, House Committee on Interior & Insular Affairs.

The revised version of the fuels policy resolution makes it clear that the objective of the study is to determine whether there is a need for an over-all national fuels policy, and if so, whether there is a need for legislation to adopt or implement a policy. The Joint Congressional Committee to be set up under the resolution would submit its report and recommendations to Congress within 2 yr. Thereafter, any proposed legislation would have to be considered by the Congress in the usual manner. This seems to me to be a fair procedure. . . . Accordingly, I have joined with my colleague from Pennsylvania in introducing the revised resolution. The numbers of the Aspinwall-Saylor bills are H. Con. Res. 661 and 662.

I am advised that the chairman of the House Rules Committee, Judge Smith of Virginia, has promised an early hearing on the Aspinwall-Saylor resolutions. This is favorable to the outlook for their adoption in the present session.

Hon. Frank E. Moss, U. S. Senator, Utah.

We must adopt a national fuels policy consistent with the aims and necessities of the people—a policy which will assure the continued growth of the United States.

I feel that the best way to establish such a policy is through the enactment of S. Con. Res. 73, of which I am proud to be a co-sponsor. As you all know, this resolution would establish a commission to study present and future fuel supplies, find out where the public interest lies, and recommend a policy which would assure the Nation of a supply of low-cost, high-yield fuels in the years to come.

Passage of this resolution would not set up a vast new government bureaucracy, nor necessarily portend restrictive government control, as some of its critics have indicated. It would, however, provide the Nation with needed guidance in the fuels field.

Hon. John P. Saylor, U. S. Representative, Pennsylvania.

The basic reason for a national fuels policy is pinpointed in a recent survey which shows that, from the beginning of time to 1900, all fuels consumed would last for 5 yr at the present rate of consumption.

Breaking the reasons down more specifically, we need a national fuels policy for conservation purposes, for national security and for the general welfare of the national economy.

Also, we would like to extend the fuels study from national to continental scope. Why, for example, should imports of natural gas from Canada be allowed to enter the U. S. duty-free while, at the same time, Canada imposes a tax on imports of U. S. coal?

Nuclear Power's Effect on the Demand for Coal, Frank K. Pittman, director, reactor development, U. S. Atomic Energy Commission.

If the national effort in nuclear power development is successful, there can be no doubt that some part of the electric power market which coal might have otherwise supplied will be lost. The loss will probably be insignificant in the next

15 to 20 yr, but may be substantial in subsequent years. There is little likelihood that nuclear energy will make substantial inroads on coal's other energy markets during this century. The losses which will be sustained, moreover, will be compensated several times over by increases in aggregate energy demands and by inroads which coal itself may make on the markets of other fossil fuels.

There is one final point I would like to make which is somewhat outside the scope of my topic, but which I feel has a bearing on it in that it offers a potential means by which the coal industry can assure that there will be a continued demand for its product. I speak of the possibility of conversion of coal to other products which are of greater value to our economy than the energy which coal now produces.

As the atom takes its place as a source of energy, the coal industry should exploit the fact that carbon is a keystone of all inorganic materials and that its use in the production of chemicals, plastics, drugs, etc., could make its position as an energy source pale to insignificance. An energetic development program which takes full advantage of modern technology, including extreme-temperature and radiation fields now afforded by nuclear processes, not only might assist the coal industry to hold its own, but also might open the door to an undreamed-of-future for this great natural resource.

TVA and the Coal Industry, R. A. Kampmeier, assistant manager, power, Tennessee Valley Authority.

If coal is to find a greater place in the markets served by other fuels, then coal and its partner, electricity, must compete in the good old American way of giving the customer more for his money. The coal producers, the power systems, and the manufacturers of equipment for both must all strive continuously for lower costs. Fortunately, there is ample evidence that productivity in the coal industry will increase as much in the sixties as in the fifties. Furthermore, there should be as many new kinds of electrical equipment developed in this decade as in the last.

To make the most of our opportunities, let us see to it that coal is delivered to the power plant, and electricity to the consumers, with the greatest efficiency and economy. If this approach is followed—and, in my opinion, only if it is—the maximum health and prosperity of the coal industry will be assured. Even more gratifying, coal's place as a mainspring in the national economy will become even more important and secure.

In discussion, **Stephen F. Dunn, president, National Coal Association,** declared the association was 100% for a sound national fuels policy and is most enthusiastic about its prospects. He said that NCA was most anxious to cooperate with all agencies interested in this proposed study which could do much to eliminate unfair competition where it exists, to prevent direct or indirect subsidies, etc.

Joseph E. Moody, president, National Fuels Policy Conference, stressed his pleasure in noting the unity of purpose evident in the total panel discussion, complimented the various speakers on their fine papers, and called for full support in coal's continuing fight to win a national fuels policy.

Luncheon Address, Fred A. Seaton, Secretary of the Interior.

A thriving industry for each fuel is certainly desirable from a national standpoint, and I believe it is a proper function of government to help maintain an economic environment within which efficient business enterprises may prosper and contribute to the national strength.

But it is not, in my opinion, a proper role of government to restrict unnecessarily the right of free economic choice by American consumers of the fuels, or anything else they want to purchase and use. Any other policy can only tend to throw our private enterprise economic system out of gear and, in the long run, destroy it altogether.

Aside from the demands of national defense, the consumption of fuels should properly continue to be determined by such factors as relative costs at specific locations, efficiency of use, dependability of supply—in short, a combination of consumer preference and cost-per-Btu delivered at the burner. . . .

Admittedly, your industry has some very real problems. Nevertheless coal, as a fuel and as a source material for many other uses, has a perhaps unlimited horizon of opportunities in the future. In the best tradition of economic competition, I am sure you recognize that fact and will seize those opportunities. And again, I assure you of the Department of the Interior's sympathetic and helpful interest.

Strip Mining

CHAIRMAN: S. F. Sherwood (left), president, Stonefort Coal Mining Co., Indianapolis, Ind. Vice chairman: J. J. Huey, director, Dept. of Plant of Equipment Engineering, United Electric Coal Cos., Chicago, Ill.

The Design of Ammonium Nitrate-Fuel Blasting Agents, George B. Clark (photo), professor, mining engineering; J. J. Yancik, research engineer; R. F. Bruzewski, associate professor, mining engineering, Missouri School of Mines, Rolla, Mo.

The effective use of ammonium nitrate as a blasting agent depends on the incorporation of a rather large number of proper design factors. Some observations resulting from the explosives research program of the Missouri School of Mines which may be of practical use to the operator are as follows:

1. A positive means of mixing the AN prills and fuel oil, such as in an ordinary concrete mixer, insures the greatest potential for obtaining the maximum available energy possible. The increased sensitivity, by virtue of the uniform composition, would help to eliminate partially detonated holes which may occur.

2. AN-fuel oil mixers which are mixed at least 2 hr before use attain near maximum sensitivity. Longer aging periods would be desirable as long as the mixture is protected from moisture.

3. The oldest stock of AN should be used first. Provided moisture is not allowed to penetrate the AN, the sensitivity and detonation velocity has been found to increase to a limited value as age increases.

4. Since sensitivity of fertilizer-grade AN is essentially constant from 1 to 7% fuel oil, the amount of fuel oil should be dictated by energy considerations which means that a balanced mixture, or approximately 5.7% fuel oil, is best.

5. The smaller the particle size of the AN, the higher the sensitivity to the AN-fuel oil mixtures. However, a compromise between particle size and density must be made because grinding not only decreases the particle size but also the density.

6. Smaller percentages of inert coatings, as little as 0.2% on fertilizer-grade

AN prills, lower the sensitivity of the oiled mixture, but have little effect on the detonation velocity.

7. Increasing the density of the fertilizer-grade AN-fuel oil explosive by tamping will increase the amount of energy available per ft of borehole. Caution must be exercised so that the density is not increased to such an extent that the mixture is too insensitive. Increasing the density of the AN-fuel oil mixture by high density additives can be detrimental in the sense that the mixture can become less ideal and, consequently, the actual blast energy obtained is less than that of the regular AN-fuel oil mixture. High density AN products to be usable blasting agents must have a high mass reaction rate such as that of the dense special AN product described.

Moving Overburden with Explosives, August Manifest, superintendent, Marco Coal Co., Apollo, Pa.

Moving overburden with explosives is an important new strip mining operation and will benefit many stripping operations like Marco Coal Co. Generally speaking, the higher the highwall, the lower the cost per yd for moving overburden by explosives. This is because of wider drill spacing. Other possible benefits are (1) reduced cost for backfill due to the even spread-out of overburden, (2) easier handling of spoil on inside curves, and (3) a reduction in the amount of dragline hoist.

What actually happens is that one-third or more of the overburden is shot across the pit and needs no further handling. The dragline now works from one end of the shot at 45 deg angle to the highwall cutting a keyway. Then it drags from the keyway.

Besides moving one-third or more of the overburden directly to the spoil bank without the need for handling, this new method is also credited with extending the operating life of the equipment, cutting maintenance costs, and reducing 'dozer time in reclamation work.

Moving overburden by explosives seems most directly useful in helping the operator with a high overburden do his job more economically.

The Electric Wheel Drive, E. R. Borcherdt, Borcherdt & Smith, San Francisco, Calif.

A prototype electric-wheel trolley-powered truck, constructed last year by R. G. LeTourneau Co., is now operating for haulage purposes at Anaconda's Berkeley Pit, Butte, Mont. The truck is expected to have performance characteristics far and above anything obtainable with the most powerful available diesel-engine operated trucks. It should carry a larger load on a steeper grade, and at a higher speed, than had heretofore been attempted with conventional equipment.

During the next 10 mo, a full evaluation of performance characteristics will be made. Some specifications of the prototype trucks are as follows:

Overall length	41 ft
Overall height	16 ft 7 in
Overall width	14 ft 7 in
Empty weight	56 tons
Struck capacity	40 cu yd
Heaped capacity (3 to 1)	50 cu yd
Heaped capacity (1 to 1)	60 cu yd

The vehicle is powered by four 400-hp, 600-v DC motors in each of the four wheels. An auxiliary 335 hp Cummins diesel is connected to DC and AC generators.

Discussion: Wayne H. McGlade, manager, product development, LeTourneau-Westinghouse, Peoria, Ill.

At LeTourneau-Westinghouse we believe application of electric power to each driving wheel is not a futuristic program but is indeed upon us today.

We are convinced a number of important problems must be solved before we really have a practical consumer product. One of the elements in the electrics that gives considerable concern is weight. Our objective is, and always has been, to produce units with as near zero weight as physically possible to make all of the weight payload. We recognize this is impractical and impossible but that is the goal.

With work currently underway in test form, we are pleased to report most substantial weight reductions in both generators and electric motors. The test work will determine whether we have adequate dependability in this reduced weight.

Further work in the direction of hydraulic wheel drives will determine (1) whether or not this means is practical and dependable, and (2) whether or not this means might be more suitable for units up to a certain size and horsepower, with other means taking over from there for added increments of size and horsepower.

Discussion: J. L. Vint Jr., president, Unit Rig & Equipment Co., Tulsa, Okla. (presented by M. Duane Lackey, development engineer, same co.)

The electric wheel drive has many desirable features including long life, a high efficiency in operation and dynamic braking power. We anticipate also that these vehicles will require less maintenance and will have better availability than present mechanical-drive vehicles.

Perhaps the most exciting feature about the electric wheel drive is that restrictions formerly imposed by mechanical drive lines have evaporated. Engine orientation has no connection to the power paths. Power on the rear wheels of a fifth wheel vehicle becomes practical and easy to provide . . .

We think [electric wheel drive trucks] can be operated at a nice profit where there is a very large quantity of material to be moved for a number of years and where either the lift is great or where electric power is quite cheap as compared to diesel fuel. It may prove economical to invest in a substation and overhead distribution, and operate trolley vehicles. A thorough study should be made to determine the most economical haulage method.

Thin-Seam Mining

CHAIRMAN: George E. Evans Jr. (left), president, Evans Elkhorn Coal Co., Inc., Wayland, Ky. Vice chairman: L. I. Cothern, director of engineering, Jewell Ridge Coal Corp., Tazewell, Va.

Mechanical Loading in 36-In Seams, by E. W. Potter, vice president and general manager, Royalty Smokeless Coal Co., Clifftop, W. Va.

Royalty Smokeless opened Medo No. 2 mine in the Sewell seam in the New River field in 1955 in a tract of 8,000 acres. Projections are to turn butt entries on 600-ft centers off the mains and to employ 2,000 ft of butt-entry belt.

Section equipment consists of a 188 loading machine, a 12-RB cutting machine with bugduster and hydraulic drill, two 8-SC shuttle cars, a roof bolting

machine, a 30-in 52-B belt conveyor and a rockduster. The crew consists of 10 men including the foreman.

In advancing, five working places are driven on 50-ft centers. The belt conveyor is extended every 200 ft to keep haul distance to a minimum. As the entry is retreated, the belt tailpiece is retracted every 200 ft to use the same dumping points as in advancing. Power cables, telephone lines and Airdox lines are extended and retracted in the same 200-ft steps. There are two production shifts and a supply shift per day.

The cycle is balanced, allowing 30 min per function per working place in rooms 28 ft wide on 40-ft centers. The company averages 10 cuts per shift or 25 tons per producer shift. Downtime costs 5 tons per manshift. Payroll productivity is 12.5 tons per man.

This productivity is not competitive. It was recognized that it would have to be raised 50%. Therefore, the company set up an experimental section a year ago using a unit built basically from a 512 cutting machine with a boring head which turns 180 deg. A new unit now is being designed that will approach 300 tons per shift, using three or four face men per machine per place.

Continuous Mining in Seams Less Than 38 In Thick, by K. S. Hobbs, superintendent, Eastern Gas & Fuel Associates, Helen, W. Va.

Operations at Stotesbury No. 10 mine are in the Pocahontas No. 4 seam which ranges in height from 31 to 40 in and averages 34 in. Main mining unit is an 86A Colmol with a cutting range of from 28 in to 44 in. The machine discharges coal over a bridge conveyor to a chain conveyor in the room. The chain conveyor is equipped with a crawler-mounted drive to reduce the time required in moving the set-up to new rooms.

Rooms are driven 28 ft wide on 60-ft centers to a depth of 325 ft. Breakthroughs are driven at 60 deg by single passes of the Colmol as the room is advanced. When the room is driven to its limit it is fanned out and the pillar is brought back in lifts parallel to the breakthroughs. The room set-up is moved daily since in two shifts the room can be driven and the pillar recovered.

The crew consists of 5½ men. Average shift production is 472 tons over the 8-mo term of use of the Colmol, although peaks of 700 tons per shift have been reached several times. The crew consists of a foreman, a Colmol operator, two pan-up men, a timberman and half the time of a cleanup man. Roof is supported entirely on posts and cribs.

Loading time amounts to 45.65% of total time, and panning requires 15% of total time. A system for more continuous transportation now is being studied to make it possible to convert this panning time to loading time.

Equipment Needs and Trends for Thin-Seam Mining, by Neil Robinson, Robinson & Robinson, Charleston, W. Va.

Basic tools for high productivity in thin seams are the loading machine with a capacity of up to 10 tpm, shuttle cars capable of carrying up to 3½ tons and the "Full - Dimension system with a potential of up to 600 tons per shift. Also of great importance are new cutting machines and other production machines that promise greater productive capacity. A productivity of 50 tons per man shift can be achieved, if management aims for 80% efficiency in the use of the tools. In this regard, top management should use the newer transportation media to get to the face where they can give first-hand attention to raising efficiency. There exist now the tools, knowledge and imagination to get these high tonnages.

One way is to reduce non-productive labor through (1) better loading and transfer of coal in belt conveyor systems, (2) mechanical tracklaying, (3) easily installed and reusable stoppings and (4) car cleaners, including vacuum types now in use in Europe.

Bureau of Mines Research in Hydraulic Coal Mining, by J. J. Wallace, supervising engineer, mining methods research, U. S. Bureau of Mines, Pittsburgh, Pa.

Experiments in hydraulic coal mining were conducted in the Pittsburgh seam in Indiana County, Pa. The coal has pronounced face and butt cleats, it is interspersed with streaks of impurities and it contains two hard binders.

The surface equipment includes a triplex plunger pump capable of producing 300 gpm at 4,000 psi. The pump is directly connected to a 900-hp diesel engine. The water is pumped into the mine through a 4-in line.

The monitor was built from extra-heavy pipe. It has the nozzle at one end and a swivel at the other. Water is conducted from the main to the monitor through high-pressure hose.

The face is opened first with an undercut about 14 in high and 6-8 ft deep made by the high-pressure stream of water. Then a shear cut is made at the rib and the remainder of the coal is broken down. Last step is to remove the drawslate hydraulically.

Using a ⅜-in nozzle, coal has been mined at a rate of ¾ tpm. The original set-up had the monitor mounted on a horizontal bar which was fastened by U-bolts at each end to roof jacks. Now the unit is mounted on an 8-BU loading machine to provide closer control of nozzle position relative to the face.

Safety

CHAIRMAN: W. E. Hess (left), manager of mines, Jones & Laughlin Steel Corp., California, Pa. Vice chairman: D. C. Ridenour, general superintendent, Olga Coal Co., Coalwood, W. Va.

Roof Cementation, D. F. Crickmer, chief engineer, Pocahontas Land Co., Bluefield, W. Va.

In the fall of 1959 we entered into a cooperative agreement with the U.S. Steel Corp, USBM and the American Cyanimid Co. to conduct further tests using a polyester resin with a peroxide catalyst as a cementing agent for strengthening roof.

Subsequently, in December, we conducted tests in an underground location on the permeability of roof shales by injecting hydraulic oil into the strata from holes bored into the roof. These holes were drilled over and ahead of the face of coal. The roof was easily penetrated at median pressures ranging up to 1,000 psi and the distribution of liquid into the roof strata was excellent.

Although to this time we have been unable to make the roof shales self-

supporting, the experiment is continuing. It has definitely been proven that a cementing material can be forced to penetrate the roof, and proper curing of the cementing material has been achieved in the roof. Those of us who have worked on this new method of secondary roof support are hopeful that, in the near future, the process may be perfected to the point that it will be economical and practical in mining.

Sonar Exploration of Roof Rocks, Dr. Charles E. Mongan Jr., consulting physicist, Cambridge, Mass.; Thomas C. Miller, health & safety engineer, USBM, Pittsburgh, Pa.

Both theory and actual experiments indicate the practicability of exploring coal-mine roof-strata through the use of sonic techniques. The term "sonar techniques" refers to the system of generating a sonic or ultrasonic beam of waves, shaping and directing the beam, introducing the beam into a medium to be studied, and examining any return waves with a view of inferring the nature of the material traversed by the waves and the presence of interfaces or obstacles in the system.

Tests in the experimental mine confirm the impression of the validity and usefulness of the method. Much lighter and more compact apparatus is desirable. The suitability of a design for use in a mine having gas or a dusty environment has also been determined. No particular difficulties have been encountered; however, details of design require much more work.

A Practical Look at Progress in Roof Control, A. V. Gibson, division superintendent, New River & Pocahontas Consolidated Coal Co., Havaco, W. Va.

Roof control begins at the face and never ceases to be one of the most important considerations in mining. But, each man must know enough to use what is available to protect himself and his machine. He must know and believe he is responsible for his fellow worker. The operator is obligated to establish a plan of roof control and furnish materials needed to comply. However, we cannot stop here. As long as men are robbed of life or limb through roof fall accidents, we have not progressed enough.

We can be brief in listing reasons why we are more concerned now than ever with protecting equipment from falls of roof. It adds up to costs—the cost to dig a machine out of a fall, the cost to repair and put it in shape, and the cost of materials for the whole operation. There is also the effect on costs of having the machine out of production or to provide and maintain a spare for such emergencies.

The second largest consideration is to provide protection for openings—other than faces—that are necessary for efficient production, haulage, ventilation, drainage and such other services that support mining.

A third consideration is a materials handling problem. In mechanical mining we usually have to handle at least a part of the rock from an unwanted fall and this adds to our cost.

Fortunately, not all roof failures result in injury or loss of life. Unfortunately, roof failures do usually add costs to mining. As long as there are items of cost that can be improved, there is a need for ways and means to improve them.

Progress in Ventilating Continuous Mining Sections, C. H. Patterson, safety director, Rochester & Pittsburgh Coal Co., Indiana, Pa.

Adequate ventilation and dust control are the major factors in preventing ignitions in coal mines. Either dust or gas may become critical if an adequate amount of pure air is not provided and the dust produced in the process of mining is not suppressed.

Prior to the advent of continuous mining, the face areas could be properly ventilated by the use of line canvas, even when the places were liberating a considerable amount of methane.

As mining techniques progressed, it became more difficult to provide proper amounts of air to the face due to the width of places being mined, the size of the equipment being used and the higher rates of advances.

It is quite evident that the immediate face area cannot be ventilated properly with an auxiliary fan and tubing alone. As a needed aid in accomplishing this, booster fans are needed to keep methane content of the atmosphere at the immediate face below the requirements of the law.

When liberation of methane at the immediate face area and from the area already mined is greater than 40 cfm, multiple or larger fans should be used.

AC power should be used for auxiliary fans when possible, thereby eliminating the possibility of volume changes due to voltage drops.

There is need for a standard way of measuring the volume of air being delivered or returned through tubes when used to ventilate working places.

Three different tools can be used to measure the velocity of air currents within the tubes, namely, the anonometer, a velometer, and the Pitot tube method. Different results were obtained from each method, indicating the necessity of a standard.

Discussion: Ventilating Continuous Mining Sections, John B. Kebblish, general superintendent, Mountaineer Coal Co., Fairmont, W. Va.

We are now operating 6 boring-type miners in the Pittsburgh seam where there is heavy methane liberation. For this type of machine and under such conditions, a single-tube and exhaust-fan system has not proved adequate to clear air from the face. There is a tendency for air to short-circuit in the tube and this system does not provide the necessary draft to push air from the far corners of the face.

Our experience shows that the use of a twin-tube main exhaust system, supplemented by blower fans mounted on mining machines, offers the best way to solve ventilation problems at the face.

Fire Fighting Experiences, W. K. Dennison, mine superintendent, Kaiser Steel Corp., Raton, New Mexico.

On Sunday morning, June 8, 1958, smoke was sighted in the Waldron Canyon area of the Koehler Mine property. Immediate investigation revealed the smoke, originating underground, was pouring out of two intake courses that surface in the canyon. A reconnaissance trip on foot from the Koehler Portal showed that the fire, burning on the bottom and ribs, was located just inby the intersection of the two main haulageways.

About 100 ft from the surface the heat was very intense and the roof was beginning to cave. This automatically ruled out any attempts to fight the fire directly

so seals in the main haulageway were begun and completed without incident. The main sources of air to the fire were blocked off by 11 p.m. However, there was no possible way to approach the fire area from the south and west sides to isolate it entirely, so about 28,000,000 cu ft of air remained available to the fire behind the seals.

Since the temperature at the Waldron seals was 128 deg the day after sealing, the area had to be cooled off before any recovery work could be started. This was done by introducing a total of 1,302 tons of liquid and solid carbon dioxide behind the seals. An airlock or ice chamber was built to contain 20 ton loads of dry ice and some liquid mixture was piped behind the fire seal. By installing a 2-ft blower, the fire gases were exhausted from the sealed area, passed over the dry ice and reintroduced into the fire area. With dry ice in the chamber, the temperature of the gases in the line dropped as low as 60 deg. When there was no ice in the chamber, temperature in the line ranged from 90 to 136 deg. The carbon dioxide would have been more effective had there not been cracks to the surface from the underground area.

Recovery operations, using McCaa 2-hr self-contained breathing apparatus with full facepiece, was started from the Waldron side. In the early stages of this work, the foam plug method of advance was tried. Sufficient foam for the height and width of the entry was generated behind the net, but attempts to advance it by manual sweeping failed. This method of underground fire fighting is apparently well worth further study and research, particularly since it has been used successfully in tests at the USBM Experimental Mine, Bruceton, Pa.

While the fire had been deprived of air from outside sources for sometime, the south and west sides were still open to the general mine atmosphere. Work was started on bypass entries that would circumvent the fire area, provide access for installing seals to encompass the area, and replace the sections of haulageways lost to the fire.

Upon completion of the bypass entries, temporary seals were installed on the south and west sides of the fire. To reduce the sealed area to a minimum, all seals were advanced to the edge of the caved area and strengthened by adding reinforced concrete in preparation for flooding. The entire area was flooded to the original roof line and is still sealed off.

In August, 1959, an inspection was made by a 3-man team from the USBM, and all of the mine, except the area behind the seals, was released from the withdrawal order which had been posted in June, 1958. It took 14 mo, three-quarters of a million dollars and 3,480 actual man hr of work while wearing oxygen-breathing equipment in a lethal atmosphere, to confine the fire into an area about 400 by 600 ft.

Coal Preparation

CHAIRMAN: R. M. Von Storch (left), general superintendent, coal mines and quarries, Columbia-Geneva Steel Div., U. S. Steel Corp., Provo, Utah. Vice chairman: A. P. Massman, preparation superintendent, Peabody Coal Co., St. Louis, Mo.

Some Economic Aspects of Coal Preparation, by F. R. Zachar, consulting engineer, Morgantown, W. Va.

Preparation is the only step in the process of coal production that can make up for cost shortcomings in mining or other steps in the process. However, preparation can cost too much if the designs for preparation have not been preceded by a careful analysis of the market. Mechanical preparation is a natural follow-up to the demise of hand loading, and mechanical preparation will require careful study and evaluation in changing from any one method of mining to another.

The coal producer should also bear in mind that freight rates affect his competitive position, regardless of the efficiency of his mining. Freight rates increased 20% in the 1948-58 decade and now amount to about one-third of the cost of coal to the consumer.

Coal characteristics may have an adverse effect upon power-plant efficiency —a matter of some concern to the coal producer. For example, excess moisture can limit pulverizer capacity, or high ash can insulate heating surfaces. Both tend to reduce the output of the power plant. For these reasons the "cost per million Btu" is not the best basis upon which coal should be bought and sold. Other factors are involved.

Progress in Preparation-Plant Automation, by R. E. Joslin, manager, preparation dept., Clinchfield Coal Corp., Dante, Va.

"Instrumentation problems in modern coal preparation plants can be compared to those in any modern factory. At our Moss No. 3 plant, we feed 1,500 tph, raw coal, where it is separated into four products . . . Each product is washed, heat dried and sized to specifications. When one considers this tonnage and knows that each product is controlled for size, quality, etc., the need for instruments is obvious."

Plant circuits include nine heavy-medium vessels, creating a problem of handling magnetite. The magnetite is handled with airslide equipment which requires about 5 min time to make the necessary connection which transfers a 70-ton carload of the medium to a 200-ton bin at the top of the plant. Also of great value is an automatic car-retarding system which eliminates a need for about 15 additional car handlers. Two men serve the car-handling function now.

Gravity in the heavy-media vessels is controlled by Accuray, a definite improvement over the Denver cup system. Automatic sampling is a necessity at a plant of this magnitude, especially since all coal is sold on a guaranteed analysis basis.

Ammeters are used to the fullest possible extent in plant conveyor controls, limit switches control belt conveyors, sump levels are monitored by probes to start or stop pumps, all bearings in the plant are lubricated automatically and so on.

Two needs still to be filled are automatic determination of moisture and reading of ash in a moving stream of coal. Dutch State mines have developed an instrument for doing the latter; it will no doubt make its appearance in the U.S. soon.

Continuous Measurement of Moisture, by Loy A. Updegraff, project engineer, Bituminous Coal Research, Inc., Columbus, Ohio.

The capacitance method of measuring moisture content in a stream of free-flowing solids has been in use in the food industries for some time. In applying the method to coal, the dielectric of the capacitor is the stream of coal in which the

moisture is to be measured. One of the conductors is a test cell rigidly imbedded in the stream of coal on a conveyor, and the other conductor is a parallel plate which may be placed under a belt conveyor or in the bottom of an apron conveyor, say.

The plates are connected through a bridge circuit to a recording pen, or possibly to a control circuit in a drying system. Changes in the moisture content of the coal create unbalance in the bridge circuit, and this situation can be employed to operate a recording device or other controls through a servomechanism.

Outstanding features of the system are low first cost, low maintenance cost, low supervision requirements and installation with a minimum of alterations.

Maintenance Costs Reduced by Redesign of Fine-Coal Cleaning Plant, by David G. Werner, maintenance engineer, Pittsburgh Coal Co., Library, Pa.

Proper maintenance of a preparation plant should lead to efficient plant operation at reasonable cost. In one instance it was found impossible to work within reasonable cost because there was just too much plant for the required job of cleaning 240 tph of ⅜x0. The only solution was to reduce costs through redesign of the plant. In the original flow the ⅜x0 from the vibrating screens was flumed to four drag tanks where it was classified into ⅜x48M and 48Mx0. The ⅜x48M is moved over a distribution conveyor to 6-way distributors for the tables, and in the process water is added in the proper amount for table feed. The 48Mx0 overflows the drag tank and traces through the pumps and cyclones and on to the distributors. Basic function of the drag tanks, cyclones and distribution conveyor is to dewater the ⅜x0 from the wet screens so that water can again be added for proper table feed.

In the new scheme coal flows directly from the wet screens to the distributors in a flat-bottomed flume. The proper amount of excess water is removed by a ½-mm fixed screen (50 sq ft of wedge wire) in the bottom of the flume. Underflow of this screen goes through the cyclones and on to the distributors.

Redesign of the circuits eliminated four drag tanks, the distribution conveyor, a 1,000-gpm cyclone pump, four 14-in cyclones, a 2,000-gpm spray pump and miscellaneous piping, flumes, valves and electrical equipment. A total of 240 connected horsepower was eliminated in the redesign.

What's New in Anthracite Preparation, by J. E. Ippoliti, chief engineer, Wilmot Engineering Co., White Haven, Pa.

Latest innovation to improve product quality and reduce costs is a totally automatic density control robot for modern heavy-media systems. The basic principle involves the use of Gamma-ray radiation from isotopes. The AccuRay density-measuring head measures density of the flowing stream of medium by radiation absorption. A signal from this measuring head is amplified and used by Honeywell instruments to control two final elements, a motorized valve in the media bypass line and a Modutrol motor which operates a rheostat on the magnetite feeder.

To further assure complete automation and exact specific gravity control there is a controlling ammeter which measures current drawn by the main feed conveyor drive motor. When the current drops below a set value, indicating no load on the coal feed conveyor, the magnetite feeder stops, allowing no additional magnetite to be introduced.

Strip-Mine Services

CHAIRMAN: R. S. Walker (left), president, Bradford Coal Co., Bigler, Pa. Vice chairman: A. E. Coddington, vice president, Carey, Baxter & Kennedy, Inc., Mahanoy City, Pa.

Electronics in Modern Aerial Mapping, by George L. Hess, sales engineer, Aero Service Corp., Philadelphia, Pa.

As in other fields, engineering and photogrammetry have been affected by automation and the applications of electronics. Four developments stand out, as follows:

1. Rapid chaining with the Tellurometer has cut costs and reduced time required to make field surveys. The instrument applies the refinement of radar to the job of measuring distances. Operation is based upon the transmission and reception of a microwave signal between a monitor and a slave unit. Speed of radio waves is used in computing distances. Adjusted surveys done by this method have provided closures in the order of 1:25,000.

2. Measurement of stockpiles and earth quantities can be done through aerial photography. Contours on the controlled photos are planimetered, and volumes are computed using the "average end area" method.

3. Cross-section data along controlled centerlines can be taken from aerial photos and transferred to punched cards or tape. Electronic computers then can provide calculations in a fraction of the time formerly required. Ground checks of these computations show agreement within 2%.

4. Radan, a new Doppler-radar aid to navigation, is a dramatic device for improving the accuracy of aerial mapping and exploration. This is a plane-positioning system which aids the pilot in flying straight, true courses when landmarks are not available. No ground stations are required, as in Shoran, Lorac and other systems.

Land Reclamation, by Walter H. Schoewe, State Geological Survey, Div. of Mineral Economics and Coal, University of Kansas, Lawrence, Kans.

Four recommendations are:

1. In view of the ever-present threat to legislate for mandatory reclamation and the more recent probability of national interference it behooves the coal industry to study its spoil bank problem, which is real, and be prepared to defend against mandatory reclamation.

2. Coal operators should practice some sort of reclamation—that which is most desirable from the operators viewpoint—without strings attached from outside sources. Such practices tend to weaken materially any claims made by proponents of mandatory reclamation.

3. Seek governmental cost-sharing participation in reclamation or rehabilitation projects in spoil bank areas. Since the government is interested in conservation to the extent of paying farmers up to 80% of the cost of conservation projects, it is neither unreasonable nor illogical to expect similar participation in reclaiming spoil banks.

4. Before voluntary reclamation or rehabilitation is considered, planned and started it would be advantageous to coal companies to seek the services of all federal and state agencies engaged in conservation, including the U. S. Forest Service and the state agricultural colleges.

Discussion: C. H. J. Breeding, field director, Ohio Reclamation Association, Cambridge, Ohio.

Crown vetch is highly recommended for reclaiming spoil banks. This plant has unusually good qualities for soil building and cover purposes. Its growth is dense, its foliage and blossoms are attractive, and a strong root system develops which is helpful to soil structure. It is about as ideal a cover as can be found. The only major disadvantage: It takes 3 yr to grow a good stand.

The Hanna Coal Co., in southeast Ohio, has successfully pioneered during the past 5 yr in extensive use of this plant for strip reclamation.

Maintenance of Wire Rope, by A. F. Meger, assistant chief engineer, Wire Rope Div., John A. Roebling's Sons Division, Colorado Fuel & Iron Co., Trenton, N. J.

A successful rope maintenance program requires careful planning. One of the first steps is to make a study of rope costs to determine where major savings can be effected. Representatives of wire-rope manufacturers can help by suggesting ways to simplify inventories of rope and by acquainting users with new rope constructions. Many companies have found it advantageous to train one maintenance or operating man in wire-rope technology to the point where he can recognize reasonable service from rope and perhaps suggest ways for improving rope life.

Also important are the handling, storage and distribution of wire rope. This includes proper lubrication, one of the most important factors in getting maximum life from rope. The rope should be suited to the job to which it is applied. Manufacturers are constantly bringing out new types of rope for special applications, which makes it highly desirable for operating men to keep up with these new developments.

Perhaps the greatest cause of rope failure on shovels is rock damage. When the highwall is permitted to overhang, falling rocks can hit the leading side of the rope hard enough to distort or rip wires out of position. Furthermore, even small pebbles can fall between rope and sheave and severely damage a number of strands.

Experiments with reeving can sometimes provide longer life for ropes, as was the case at Ken Coal Co., where the bucket of a 1050-B is made free-floating through continuous reeving. Practice and training of crews may lead to reduced time requirements for rope changes which is one way of cutting the costs of using wire ropes. Other studies tend to show that purchased slings, which will develop full rope strength, are more economical in the long run than mine-made slings.

Maintenance of Strip-Mine Rolling Stock, by Roy M. Leseney, mechanical superintendent, Truax-Traer Coal Co., Fiatt, Ill.

One of the best forms of preventive maintenance for stripping equipment is a well-shot highwall. Similarly, preventive maintenance for rolling stock starts with well-built, well-maintained, frequently sprinkled haulage roads. These conditions minimize damage to truck frames, suspension systems and engines.

In the way of special equipment, Truax-Traer employs a tractor-drawn magnet to remove nails, spikes, and other metal objects from roadways. The idea of a garage foreman is a special switch which cuts off the fuel supply to an engine if oil pressure fails to build up properly. T-T also employs a "roving mechanic" in a radio-equipped pickup truck. He carries a supply of the most commonly used parts and is on call at all times for emergency service.

Also falling in this special-service classification is a spare-parts pool maintained by the various companies operating in the northern Illinois fields. Each operator stocks certain large shovel parts, such as DC motor armatures, generator armatures and motor coils. When one mine needs a part not in its own stock it is borrowed from the mine stocking the item. All operators are protected with a minimum cash outlay. In addition, the Open Pit Mining Association has compiled a list of all electric shovel, dragline and truck parts which are interchangeable. This list shows which mines have spares.

Machines are bought to produce, not to be maintained. However, cooperation among operating and maintenance men can head off troubles, which leads to maximum production with least downtime.

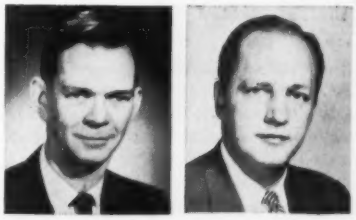
Use of Bulldozers as Supplemental Tools to Revolving Excavators on Open-Pit Mining Operations, by Charles Cooper, instructor in open-pit mining, University of Pittsburgh, Pittsburgh, Pa.

Possibilities for cutting costs and improving production through the use of bulldozers should be analyzed and considered when stripping operations are being planned. In one example, based upon removal of 36 ft of cover to expose a 2-ft-thick coal seam, the author showed that with the dozer removing 16 ft of cover the cost per ton of coal was $1.20. With the dozer removing 12 ft of cover cost per ton of coal was $1.21. Assuming complete removal of the 36 ft of cover by a 5-yd dragline, the cost per ton of coal is $1.38.

One of the difficulties in calculating costs for dozer stripping arises from the fact that grades change as the job proceeds. However, careful planning can be employed to control these grade changes and increase the accuracy of estimating.

The stripping capabilities of bulldozers have been remarkably increased in recent years through the development of larger units, hydraulically-powered attachments, including blade-tilt cylinders and rippers, U-shaped blades, improved power-transmission systems and power shifting.

Underground Haulage



CHAIRMAN: David Ingle Jr. (left), president, Ingle Coal Corp., Elberfeld, Ind. Vice chairman: John W. Straton, general manager, Lorado Coal Mining Co., Lorado, W. Va.

New Developments in Belt Haulage, by Harry W. Meador, general superintendent, Stonega Coke & Coal Co., Big Stone Gap, Va.

During the past decade a number of significant developments have taken place in underground belt-conveyor transportation of coal. These include (1) the development of the rope-frame conveyor, (2) changes in the design of carrying idlers, (3) introduction of solid-woven belting and (4) development of conveyor equipment to link continuous miners with butt-entry transportation media.

In the future there will be growing interest in the use of carrying idlers with 35-45 deg troughing angles. This would provide higher capacity for the same belt width and less spillage.

One manufacturer reports working on a crowned return idler. Trials indicate that training of the return strand of belt is much improved with this type of idler. When used on a rope-frame unit this idler would be suspended from the side cables rather than mounted on the cable-support stands.

Attention is being given also to evaluation of new synthetic fibers, development and evaluation of new rubbers and plastics, improvements in fabric weave design for more efficient utilization of material capabilities.

New Developments in Underground Rail Haulage, by W. H. Coghill, assistant chief industrial engineer, mines, Republic Steel Corp., Cleveland, Ohio.

At Republic mine, Pikeville, Ky., initial underground haulage was handled by conveyor that handled a sizeable reserve. Typical of the area, the coal followed mountain ridges and spread into many fingers for considerable distances. Further expansion of the conveyor system would mean many transfer points, so rail haulage entered the picture. Good installation of a 42-in gage track and controlled grades were the rule in building a system over which 3,400 tpd of raw coal is hauled.

At older Banning mine, Van Buren, Pa., a new slope tapped solid coal and this area was equipped with a track system using 85-lb rail. An older retreat area was completely overhauled, installing 60-lb rail in place of the 40-60-lb rail formerly used. Trailing locomotives at this mine provide braking effort on grades up to 8%. Haulage systems at two other mines now are being revamped.

A high level of engineering was involved in all this work, upon the basis that haulage costs can be evaluated against underground grades. The work begins with selection of car capacity and locomotive weight desired. A profile of all haulageways is then prepared, and the costs of construction for producing grades that will provide the necessary output are calculated. This is done on the basis of the number of cars per trip that will give the required tonnage and the desired speed of operation. From these data curves are plotted showing total dollars for equipment and construction against grades or numbers of cars per trip. Optimum conditions could be read from these curves.

New Development in Shuttle-Car Haulage, by John S. Todhunter, general manager, Barnes & Tucker Co., Barnesboro, Pa.

The Joy 18-SC shuttle car has six wheels, two at each end for steering and two at the center for driving. The car is hinged across the middle and both ends pivot about the driving section. Each side is chain driven and no wheel units are required. The vehicle is 32 in high; capacity is 4 tons; discharge time is 45 sec.

The operator's cab is between sets of wheels, thus eliminating the rough ride experienced on four-wheel cars where the operator rides a corner.

Smooth operation has resulted in the new cars, and an average of 3.95 tons is dumped on each trip. Although the newer cars have been in service only since January, 1960, the resulting improvements in costs and tonnage have been gratifying. Although the design may appear to be unorthodox, the car has worked remarkably well at Lancashire No. 15 mine. Twelve of the units are now employed at the mine, out of a total of 17 cars. Mining machines include seven Colmols, three 3-JCM Joys and a 14-BU loader.

Coal height averages 42 in (Lower Kittanning seam) and varies from 39 to 46 in. A top bone of from 2 to 8 in in thickness is left up. All entries are on 60-ft centers with crosscuts staggered on 80-ft centers. Rooms are driven on 45-ft centers off the butts, on the outby side advancing and on the inby side retreating. Pillars are taken as rooms are worked and heading pillars are taken as the inby rooms are worked back. This system has been in use at Lancashire since 1931, through phases of hand loading onto conveyors, conventional mining and continuous mining with shuttle car haulage.

Belt Maintenance at West Kentucky Coal Co., by Buddie R. Morris, industrial engineer, West Kentucky Coal Co., Madisonville, Ky.

East Diamond and Pleasant View mines of West Kentucky Coal Co. now employ all belt transportation in which losses of $3,900 per hr can be incurred if the conveyor systems fail to function. The first order of business is to get proper design in belts and drives, then follow up with a good preventive maintenance program.

In the purchase of new belt, West Kentucky includes a safety factor in determining the maximum load the belt will carry by considering the periods when production will exceed averages. Experience has taught that this should be 140% of average tonnage. Tension ratings are figured on the same basis. All headframes are symmetrical so that all sprockets and gears can be used on either side; all 42-in belts are purchased with horizontal takeups to reduce installation costs and inspection costs associated with vertical takeups.

Wound-rotor motors are used to drive all belts; all transfer points are well lighted; and each belt is equipped with protective devices to prevent slippage, sequence failure, chute plugging and so on.

Each drive is visited monthly by a mechanic who checks alignment and makes necessary correction. It has been noted that return idlers give the most trouble. It is important to alignment that coal be loaded at the center of the belt. Other good practices include keeping spillage cleaned up to keep all idlers in motion and being careful in lubrication to prevent spillage of lubricants. All splices should be made to specifications.

Costs of a program like that in use at West Kentucky amount $0.151 per ton, r-o-m, or $0.071 per ton-mile.

Conversion of Manual Hoist to Automatic Operation, by Hollis Pierce, chief electrical engineer, Old Ben Coal Corp., Benton, Ill. (Coauthor: W. J. McDonald,

application engineer, General Electric Co., Schenectady, N. Y.)

Old Ben's new Mine No. 21, near Sesser, Ill., is equipped with a shaft hoist which was already on the company property. For the new application it was converted from manual to automatic operation. The old duty cycle for the manually-controlled hoists was, at the time of purchase, the fastest of their day, 200 trips per hr with a total lift of approximately 500 ft. Load was 27,500 lb.

New duty cycle, automatic control, will hoist 48,000-lb load and make 80 trips per hr with a total lift of 800 ft. Coal load is 10 tons. New drums were required to accommodate the longer ropes. The old drum was 7x11-ft cylindro-conical; the new are 9-ft straight.

The General Electric automatic mine hoist control is of the modern "Master" control type. This system does not require the usual operator's console, although several modes of operation are available, referred to as manual, test, semi-auto and auto.

Basic portions of the control are classified as regulator, programming and safety provisions. Regulators include high performance speed and current-limit regulator. The main programming device, called a QC switch, is a gear-driven speed reference.

Major safety features include provisions to prevent overfilling of bins at the surface and dumping underground with no skip in place. Emergency stop buttons are provided at all hoist stations, and hold buttons at remote control stations will temporarily halt operations. (See article on automatic hoisting in this issue, beginning on p 108.)

Maintenance of Track Haulage Systems, by J. S. Schrecengost, chief engineer, Allegheny River Mining Co., Kittanning, Pa.

A track-haulage system properly installed with the best available materials today is the most nearly continuous interruption-free and safest type of haulage. In view of its advantages track haulage will be with us for many years to come. Therefore, careful consideration should be given to each element that goes into a track haulage system because the maintenance cost of the system is dependent upon the materials used and the excellence of construction.

It is unwise to weigh the capital investment in new modern equipment against the use of obsolescent equipment merely because the latter is available. It will cost much more over the life of the mine and may have to be replaced anyway.

Track haulage maintenance also includes the attention that must be given to rolling stock. Other factors to be considered in arriving at a low overall cost include the use of mechanized track tampers, for example, to reduce installation labor, and the use of mechanized track cleaners for better housekeeping and lower rockdusting requirements. Clean track makes a favorable impression on inspectors, visitors and management.

There has been too much attention given to holding down the original capital expenditure, thereby prohibiting the best construction and use of the best equipment. It is not a matter of how much an installation costs, but the rapidity with which that investment can be amortized in the maintenance of the system.

Management and Cost Control

CHAIRMAN: R. H. Jamison Jr. (left), president, Delmont Fuel Co., Hunkers, Pa. Vice chairman: George McCaa, general manager, Hanna Coal Co., Moundsville, W. Va.

People, James L. Hayes, dean, School of Business Administration, Duquesne University, Pittsburgh, Pa.

Management is getting things done through people. Therefore more emphasis should be placed on motivating people than on techniques of management.

Managers will get more out of people by setting objectives for individuals. Too much stress is put on how to do a job—not enough on what the job is being done for. Providing people with a goal and a sense of accomplishment is a key factor in motivating people.

Another key factor is more effective communications, the keystone of which is personal integrity. You must get people to believe in you before you can communicate effectively.

Managers should also realize that motivation for change rests with the individual. But it is their job to find the means of inspiring the individual to change.

The greatest source for profit improvement in companies today is in improving on the management of people.

Dr. Quin F. Curtis, chairman, Dept. of Philosophy & Psychology, West Virginia University, Morgantown, W. Va.

The coal industry has a more effective personnel program and a wider variety of personnel practices than generally realized. And, furthermore, these practices have a high degree of sophistication. There is, however, considerable room for improvement in evaluating the effectiveness of personnel programs, in developing better methods for rating employee efficiencies, and in setting standards for hiring procedures.

Looking to the future, it is possible to make certain predictions. For example, it will became an increasingly difficult to find younger workers with necessary drive for job fulfillment. At the same time, however, the time will come when psychological testing will be used to evaluate this factor.

The time is also approaching when management philosophies and practices about supervision will become more formalized and more uniform.

Personnel Evaluation and Selection, John N. Crichton, executive vice president, Johnstown Coal & Coke Co., Johnstown, Pa.

A sound program of "Personnel Evaluation and Selection" is an essential business tool in developing executive and supervisory talent.

No fancy plans are needed to have such a program. But you must have spent some time in self-appraisal. And you must maintain a system of continuing educa-

tion so that the best type of employee will be available at the time of selection.

A well organized training program starts with the company president and reaches down to the lowest worker. There are things the president needs to know, and there are things he needs to teach others. The same holds for each supervisor. Training should begin the moment a new employee walks in the door and must continue until he walks out.

By spending a little time each day with each man under them, section foremen and supervisors of any type can learn how to know the employee a great deal better. This makes for effective leadership. Effective leadership is no different than effective living. The effective leader seeks to grow, to discover and put into use his full potentialities. He seeks these growth processes for himself and simultaneously strives to create relationships where others can seek the same.

C. G. Evans, personnel director, North American Coal Corp., Cleveland, O.

Personnel evaluation and selection—getting the right man for the job—requires valid methods of determining qualifications, traits and abilities instead of reliance upon an interviewer's judgment. Methods include various tests and an application form filled out under the direction of a trained interviewer.

Generally, tests are divided into these categories: (1) intelligence tests which refer to the overall mental ability of the individual; (2) aptitude and prognostic tests which predict performance of learning in a new situation; (3) special ability tests which attempt to measure creative ability; pyschomotor tests which measure performance of adaptive physical activities such as coordination and speed of reaction; and (4) achievement tests which determine how much a person has learned from special activity such as attendance at a training course or school.

To establish job employment norms for rating applicants, North American Coal selected presumably good men in various job classifications, who were then tested by two consulting firms. Results of these tests provided a tentative range of scores for rating. Continued employee testing has shown that some tentative employment norms have been set too high. These will, therefore, be downgraded on the basis of a realistic appraisal.

Electronic Computer Activities in the U. S. Steel Corp.'s Coal Div., R. D. C. Morris, assistant to the vice president, operations-coal, U. S. Steel Corp., Pittsburgh, Pa.

To obtain optimum coal quality and consistency, a new tool, known as statistical quality control, has been introduced to our coal operations. The function of this tool is to indicate when significant quality changes have occurred in washed coal products, as measured by accepted quality standards. This job is done with a 650-digital computer which provides information rapidly for making positive and timely decisions on the operation of coal washers, the blending of coals, and the burdening of blast furnaces.

Through statistical analyses we have tested, day to day, cumulative weekly and monthly analyses for continuity and consistency of the averages for ash, sulphur and moisture, as well as for the degree of variability in current periods vs. the previous month. Statistical analyses are made available to metallurgical, blast furnace, coke-oven and coal operators so that timely remedial actions can be taken if significant differences are apparent. Our collective aim is to supply the steel mills with coals which consistently meet optimum price-quality considerations.

A rather unique use of the 650-computer is for developing production and equipment hours-standards for continuous miners. This application is a most successful one and is designed for a wide range of seam conditions. Within reason, therefore, this use can be applied to various mine locations, beyond the district for which it was initially developed.

Underground Planning and Control Using Electronic Computers, W. L. Zeller, assistant district industrial engineer, Frick District, U. S. Steel Corp., Pittsburgh, Pa.

Modern computer - programming techniques make electronic computers a practical and powerful new tool for production planning and cost control in the coal mining industry.

Advantages of computers can be summarized as follows:

1. They can bring about cost improvement when applied to accounting functions such as payroll and other forms of data processing.

2. Because of their speed, they can provide timely answers to many difficult problems which would never be solved by hand because of the time and cost required for such a solution.

3. They permit the use of complicated forms of higher mathematics in the solution of problems by persons who are not familiar with the processes involved.

4. They can be used to unshackle creative thinking by removing the time-consuming process of hand calculations and by allowing the thought process to soar in the scope and complexity of problem solutions.

Capable as these machines are, they are useless without being provided with intelligence by engineers and technicians. Every move the machines make must be dictated, and the effect with which they are utilized is dependent on the intelligence with which they are programmed. It is more evident than ever that our technical organizations must be staffed with engineers who can learn the know-how and the know-why of this 20th century tool. When this is accomplished, we will have more time available for constructive planning and the direction of effort into the areas of improving methods and reducing costs.

Underground Power

CHAIRMAN: John Stachura (left), vice president, Enoco Collieries, Inc., Bruceville, Ind. Vice chairman: James Erskine, electrical engineer, Eastern Gas & Fuel Associates, Pittsburgh, Pa.

Design of a Power System for a New Mine, by F. G. Hamner, systems planning engineer, Southern Services, Inc., Birmingham, Ala.

Southern Electric Generating Co. (SEGCO), jointly owned by Alabama Power Co. and Georgia Power Co., is opening two new coal mines in Alabama. The properties are projected to yield a total

of 2 million tons per yr. The decision to use AC power was based upon the wealth of information available on the subject, the up-to-date mining code of Alabama and the recommendations of Dr. Milton H. Fies, advisor to the planning staff.

First step thereafter was to prepare a single-line diagram of the proposed system, indicating the exact nature of the equipment. Next a conference was held among company engineers, representatives of the Bureau of Mines and engineers of the Alabama Industrial Relations Dept., Mining Safety Section, to make certain that the plan was in harmony with safety requirements of state and federal governments. Alabama By-Products Co. then was chosen to construct and operate the mine as agents for SEGCO.

In general the underground power system is identical with that proposed by the Underground Power Committee of the American Mining Congress. Where the design differs it is in the nature of something additional rather than a deficiency.

DC power is provided from a silicon rectifier to supply a trolley system for handling supplies, with battery-powered cars carrying the supplies from the track to working sections. Coal is transported to the surface on AC-powered belt conveyors. Face haulage is provided by AC-powered shuttle cars.

Silicon Rectifiers for Mining Service, by Ralph E. Wahl, senior design engineer, General Electric Co., Philadelphia, Pa.

Lower cost and higher efficiency at reduced weight are major advantages of silicon rectifiers in underground use. Silicon power cells may be cooled by forced air, thus eliminating a need for water-to-air or water-to-water heat exchangers.

Silicon cells at present have inverse ratings in excess of 600 V with ratings of 1,000 V expected in the near future. Surge voltages generated by intermittent operation of load devices, such as motors, are severe. However, sufficiently high inverse voltage rating with surge protection provides adequate margin of safety. Other circuit controls have been incorporated to provide lightning protection and short-circuit correction.

Means external to the cells must be used to provide voltage regulation of output power. Many means are available to accomplish this, but a 3-phase, partial range power amplistat is preferred.

The rectifier and transformer equipment can be mounted on two mine cars. Main components of the transformer car are a compact, lightweight, sealed-dry transformer and a fused air interrupter switch. The transformer is cooled and insulated by sulfur hexafluoride, which reduces the weight to about 50% that of a liquid-filled transformer. Liquid-filled transformers can be supplied when needed.

Electrical connections are made by bringing three AC leads to the interrupter switch on the transformer car, connecting leads between transformer car and rectifier car, and making two connections for DC output power.

Silicon Rectifiers, by C. L. Sarff, chief engineer, Hanna Coal Co., Moundsville, W. Va.

Ireland mine had two conversion units in service, a glass-bulb rectifier and a mercury-arc unit, about 2½ yr ago when the news of the silicon rectifier and its success in the chemical industries came out. Since there was need for a third conversion unit it was decided to make a thorough study, including the silicon rectifier as a possibility. It was found that the cost of a silicon unit was much less than that of a mercury-arc unit ($80 per kw against $110) and competitive with that of the glass-bulb unit. Another of the deciding factors, which subsequently led to the purchase of a silicon unit, was its simplicity for maintenance purposes. Reliability could not be proved in advance, but extra capacity was designed into the unit to provide a safety factor. Experience shows that the possibility of failure is remote if any kind of an inspection program is followed.

The Ireland system is unregulated. Regulation is somewhat expensive, so the matter should be carefully studied for each individual operation. Higher efficiency was not a factor in selection, yet the savings for this reason amount to $550 per yr.

Two 500-kw silicon rectifiers now are in use at Ireland, the first having been placed in service 15 mo ago. Performance has been excellent. There was some early trouble with diode replacement, but changes in methods of manufacturing solved the problem.

Experience at Ireland mine indicates that silicon rectifiers are the most economical, most reliable and simplest conversion units on the market.

Safety and Operating Costs Can be Improved by Trailing Cable Study, by Frank R. Hugus, chief electrical engineer, Coal Machinery Div., Joy Mfg. Co., Franklin, Pa., for AMC Committee on Underground Power.

Purpose of the committee's paper is to propose a comprehensive study of trailing cables to improve safety and reduce operating costs. Close cooperation among cable manufacturers, equipment manufacturers and mine operators will be required. Cable manufacturers need more knowledge of the number and types of cable failures per 1,000 ft of cable for the various types. Only through accurate and informative data from the field can the causes of trailing cable failures be evaluated effectively and a positive program established to decrease such failures.

The AMC Committee on Underground Power will solicit cable information from mine operators, who will be asked to keep simplified records for a period of time. A questionnaire will be employed to determine various yardsticks of cable performance, then the information thus obtained will be made available to the industry at large.

Maintenance of Mine Power System, by A. E. Molinski, supervisor of maintenance, Johnstown Div., Bethlehem Mines Corp., Johnstown, Pa.

The four major components of a mine power system using DC power for face equipment are primary high-voltage distribution, AC to DC conversion equipment, DC feeder distribution and trailing cable. Maintenance problems on primary high-voltage distribution systems generally are not serious. However, the maintenance of conversion equipment is of utmost importance. Periodic inspection, on a very definite schedule, should be required, including lubrication systems, cooling systems, commutation, bearings and so on.

In DC feeder distribution systems the quality of the original installation exerts a strong influence on later maintenance requirements. Generally, better voltage can be maintained on face equipment by the use of two or more smaller cables than one larger cable of equal cross-section. The current capacity of the multiple cables will be greater because of

the more efficient cooling of smaller cables. For example, a 2,000,000-CM copper cable carrying 2,462 amp will have about a 13% higher voltage drop than two 1,000,000-CM cables carrying the same current.

The return side is no less important than the positive in a DC system. One of the major shortcomings is poor bonding where the rail is used as a return.

Full attention to trailing cable maintenance, including the proper mechanical functioning of reels and sheaves, is vital. Changing an entire cable may be the better approach, in order that broken cables can be shop spliced.

One avenue to better face voltage is to make idle-day voltage surveys of mining sections to compare actual vs. calculated voltage drops. The resulting data will show where improvement or reinforcement of the system is needed.

Experience With AC Mining, by Otis G. Stewart, executive engineer, Union Carbide Metals Co., Alloy, W. Va.

Advantages of AC power for face machinery are:

1. A sizable saving in first cost of conversion equipment.

2. Greater ease in locating conversion equipment close to the face and greater ease in moving it to new locations.

3. Possible use of higher transmission voltages, thus saving on conductor costs and improving voltage regulation.

4. Reduction of shock and fire hazards as a result of more efficient switching and better protective relay systems.

5. Reduced maintenance costs by eliminating rotating converters.

6. Increased efficiency of transformers as compared to DC converters.

Only a few years ago the procurement of equipment for AC application underground was very difficult. This was followed by a period of unreasonable restrictions and criticisms from state and federal mine inspectors.

The record with AC power at this mine is outstanding with respect to safety and maintenance. Of course adequate face voltage must be maintained in AC systems, but this provides an incentive for face supervision to do just that. Experience with cables has been remarkably good.

"It is my belief that as experiences such as ours with AC operation become well publicized, more and more mines will be converted from DC to AC. In the future new installations will be almost exclusively AC." (See article on AC power by Mr. Stewart in the April 1960 issue of *Coal Age.*)

Thick-Seam Mining

CHAIRMAN: C. O. Kane (left), manager of coal mines, Armco Steel Corp., Montcoal, W. Va. Vice chairman: J. A. Younkins, assistant general superintendent, Duquesne Light Co., Pittsburgh, Pa.

Conventional V. Continuous Mining Equipment in Seams 38 to 48 In Thick, Harry LaViers Jr., vice-president, South-East Coal Co., Irvine, Ky.

Operating three deep mines with a 1959 output of 850,000 tons, South-East employs six Lee-Norse CM33X miners and one Joy Super 14BU outfit. The first miner was installed in October, 1956, and conversion to this type of mining was substantially completed by June, 1958.

Conventional units, 11-man crews, averaged 300 tons per machine-shift in 1956; continuous units, 6-man crews, 325 tons in 1959. The percentage of salaried employees increased markedly as a result of cuts in crew size. As a result of this and other developments fixed overhead has increased materially. However, there was only a slight increase in output of ⅜x0 coal—22 to 26%—though as a result of more natural output of 2x0 and less crushing the percentage of ⅜x0 in the shipped product is actually less. Hardgrove grindability of the ⅜x0 increased, but there was no change in the washability of the raw coal beyond a rise ½ percentage point in the reject, thought to come from a certain unavoidable cutting of the top rock. Use of miners has slightly cut per-ton maintenance cost, with a major saving in cable cost in addition to others.

Experience with the miners showed a need for a new section haulage setup to ease the problem of moving loading points and also keep distance down. Section belts were the answer. Development work has been cut and concentration also has permitted a better job of track-laying. On the other hand, power and air costs are up, and qualified operating and maintenance men are not yet available in the necessary numbers.

Factors Affecting the Choice Between Continuous Miners and Conventional Equipment, W. F. Diamond, Manager of Engineering, Island Creek Coal Co., Holden, W. Va.

Many factors are involved in a choice between conventional loading units and continuous miners. Adaptability of the available machines to seam conditions heads the list. Considerable thickness variation or heavy partings in certain areas and not others tend to favor conventional equipment—also the fact that the units can be scattered to balance the raw feed, whereas concentration is more necessary with miners and more downtime and higher maintenance follows use of such equipment in heavy partings, along with a decrease in clean-coal output and higher cost.

If a substantial coarse-coal market exists, this also tends to favor the conventional unit—and a coarse raw product also can be an asset in other than retail markets, especially if the ash content of the raw coal is such that separate coarse and fine-cleaning with thermal drying are necessary. The coarse-coal facilities can be purchased and operated for less. In an existing plant, aside from the problems growing out of increased fine coal as such, heavy spraying at the face can result in dust ride-over in preparation, adding to clarification and fine-coal moisture problems.

Roof, bottom and ventilation factors also must be evaluated. If drop bottom cars are used, for example, the slope of the side sheets must be 45 deg or more for good dumping with miner-produced coal.

In development, miners frequently produce at a rate 20 to 25% under that in room-and-pillar work—at a higher maintenance cost—though part of the difference may be offset by an increased roof-support problem in pillaring. As to capital costs, addition of a pickup loader because of poor cleanup substantially increases total per section. More money is required for the parts and assembly inventory. And, though productivity per man is higher, output per section is less, requiring more miner units.

But "it would be a rare mine which had all the conditions I have mentioned which would tend to discourage the use of continuous miners. The concentration which the use of miners normally makes possible, with consequent reduction in costs, will go far toward offsetting some of their disadvantages . . . No choice of equipment can be made that will have all advantages and no disadvantages

. . The final choice will depend upon the value those making the decisions place upon the advantages they get and the disadvantages they must accept with the equipment finally selected."

In line with this reasoning, Island Creek recently selected conventional equipment for one property to get a more-favorable capital cost, a better break in preparation and ability to meet fairly wide variations in mining conditions. At another, miners were chosen because of softness of the coal, absence of rock partings, the advantage of considerable weight on the pillars, and the ability of the preparation plant to handle the fines.

Equipment Needs and Trends for Mining in Seams Over 48 In Thick, E. H. Greenwald, partner, Eavenson, Auchmuty & Greenwald, Pittsburgh.

All things being equal, cost of production varies inversely with the thickness of the coal. Those mining coal over 48 in control the prices because they have the control over cost.

Accelerating evolution is the picture today. The danger is in not having the proper perspective and thus making a mistake in the future. Acceleration may be inferred from the 10-yr record of evolution in one field. In this field, in contrast to a 175% increase in inflation and an 89% rise in base wage rate, direct labor has dropped 22%, productive labor, 32%, and service labor, 10%. Mine supplies have risen 56%, while overhead and administrative charges have dropped 8%. In maintenance, labor cost has risen from 8 to 14% of total labor, up 36%, and supplies from 20 to 30% of total supplies, up 134.

The trend places a premium on realizing the full capability of equipment in the future. Otherwise the industry could experience a cost increase of 6% in the next 10 yr, and "I don't think it could stand it." Equipment design and field operations must be directed toward keeping machines running without major attention or overhaul. This reflects the fact that first cost is less important than maintenance at levels of the past—or even the future. If maintenance cost can be gotten under control and full capability realized, the industry could cut costs 10% in the next 10 yr instead of experiencing an increase.

Productivity of Continuous and Conventional Mining Equipment, R. L. Anderson, Commodity Industry Analyst, U. S. Bureau of Mines, Washington, D. C.

Continuous mining as known today began in 1948, and production figures were first separated out in 1952, in which year continuous units accounted for 3% of the underground output. In 1959, the estimate was 29%.

For 1958, productivity by various types of operations was as follows:

Continuous mining only—45 mines, 9.56 to 18.48 tpm for the nine states in which the mines were located.

Continuous and conventional mining—167 mines, 12 states, 8.81 to 18.49 tpm.

Mobile loading into mine cars—15 states, 6.64 to 11.42 tpm.

Mobile loading into conveyors—5.61 to 9.46 tpm.

Mobile loading into shuttle cars—373 mines, 15 states, 7.14 to 14.79 tpm.

Duckbills and other self-loading conveyors—seven states, 6.79 tpm.

Hand-loaded face conveyors—222 mines, 17 states, approximately 1 tpm less than mines using duckbills.

Mixed types of loading—178 mines, 17 states, 3.18 to 16.14 tpm.

Hand loading—2.74 to 7.23 tpm.

All deep mining—9.58 tpm.

Stripping—21.54 tpm.

Auger mining—28.15 tpm.

All coal mining—11.33 tpm in 1958.

Fine-Coal Preparation

CHAIRMAN: W. D. Hamilton (left), vice president, Oglebay Norton Co., Cleveland, Ohio. Vice chairman: J. D. Snyder, chief engineer, Blue Diamond Coal Co., Knoxville, Tenn.

Fine-Coal Cleaning With Tables, by C. W. Porterfield (photo), director of research-testing and sales liaison; A. E. Copeland, assistant chief engineer, and Guy N. Haynes, superintendent of preparation plants, Pocahontas Fuel Co., Pocahontas, Va.

Although wet tables were in widespread use in the U. S. for years, the first installations in the Pocahontas field were made in 1949. Now, about 55% of the fines in the field are cleaned on these units. Since 1954 Pocahontas Fuel Co. has installed 48 single-deck Deister tables and 40 Model 77 or double-deck units. Capacity of the table is dependent upon the kind of product you wish to get from it, the washability of the coal and the ash in the raw coal. Although Pocahontas Fuel has stringent ash requirements, the company's preparation specialists figure on a capacity of from 12 to 15 tph per deck. The recommended figure is 10 tph per deck. None of the tables are receiving truly classified feed, although some operators dedust or desilt ahead of the tables.

Double-deck tables are preferred now because they are less expensive to install, floor space is conserved and they are much easier to adjust. For example, the end elevation can be adjusted by turnbuckles with the table in motion until the desired results are attained. Several trials with shims may be required to make the same adjustment on a single-deck.

A breakdown of capital costs for a table plant shows the following: Engineering, 9%; structure, 23%; feed preparation, 6%; Model 77 tables, 5%; conveyors and pipes, 5%; mechanical dewatering, 6%; thermal drying, 23%; water clarification, 12%; wiring and controls, 9%, and heating system, 2%.

Fine-Coal Cleaning With the Feldspar Jig, by R. K. Bogert Jr., president, Badger Coal Co., Philippi, W. Va.

In April 1957, Badger Coal Co., Inc., began operating a new coal washer near Philippi, W. Va.

When cleaning operations began it was learned that the quality of raw ¼x0 coal, as loaded, was much lower than hoped for. Ash was approximately 20%, which was double the amount that could be tolerated to obtain the desired Btu content. This condition was caused by degradation and freeing of high-ash banded material resulting from mining operations and transfer from the portal through a large raw coal storage bin, crusher, and raw coal vibrating screens.

Immediate steps were taken to obtain information necessary for corrective measures by retaining Commercial Testing & Engineering Co. to make a complete analysis of the ¼x0 through product from the raw coal screens. This analysis, coupled with negative results from a dry cleaning test, space limitations and again the necessity to keep capital investment to a minimum, prompted the selection of a feldspar jig as the cleaning unit. It was further decided to install centrifugal drying only and not go to thermal. The equipment selection has proven satisfactory. The washer is delivering a very acceptable product and moisture is reduced by the centrifuge to as low as 3.5% surface; the latter is due to a very fortuitous circumstance in that the coal proved to be extremely water repellent.

This was the second installation of a feldspar jig in the United States, and understandably, mechanical operating difficulties were encountered at the outset. Reject percentages at first varied from approximately 20 to nearly 40%. Mining conditions have since reduced rejects to below 20%.

Fine-Coal Cleaning With Heavy-Medium Cyclones, by J. P. Matoney, chief engineer, Heyl & Patterson, Inc., Pittsburgh, Pa.

In a slide presentation the author presented the theory of the coal-washing cyclone and developed curves by which the performance of the units could be evaluated and predicted. The use of the cyclones stems from studies which indicate that fine coal will have to be cleaned at low specific gravities to serve the market of the future.

In practice the medium is fed tangentially into the cyclone to produce gravity differentials between the air core and the wall of the cyclone to make effective separations between coal and refuse.

The system has been applied to cleaning bituminous fines, and it shows promises as an additional tool for reclaiming marketable anthracite from culm banks in the Pennsylvania Anthracite region.

Fine Coal Drying, by Paul Levin, project engineer, Allen & Garcia Co., Chicago, Ill. (Read by Donald Dowlin, Allen & Garcia Co.)

Paper has been prepared to give the coal operator some idea of the type of calculation which must be carried out in the design of a coal dryer.

Consider the case of a hypothetical dryer designed to dry a washed ¼x0 coal which has previously been dewatered by centrifuges and vacuum filters. It is assumed that the coal, at a tonnage of 200 tph wet basis, will have a total moisture content of 11% and that it is desired to dry the coal to a moisture content of 4%. The following ambient conditions are also assumed: air temperature, 70 F; relative humidity, 80%; barometric pressure, 14.7 psia (sea level).

Performing the necessary calculations, it will be found that the total heat that must be added to the dryer is 52,792,000 Btu per hr; this must be carried into the dryer by 257,600 lb of dry air per hr, plus its water vapor. Thus the air and vapor must be heated in the dryer furnace to a temperature of 871 F. The volume of air required for the process at ambient conditions can also be calculated from the weight of dry air required in the dryer, correcting for its water vapor. The air volume will be 58,200 cfm. If it is assumed that the coal available for the dryer furnace contains 13,500 Btu per lb, the furnace coal consumption then is 1.95 tons per hour. Expressed in another way, one ton of coal fired will dry 102 tons of wet coal in a thermal dryer.

Mr. Cook

Mr. Hebley

Mr. Hall

Mr. Sawyer

Stream Pollution

Impact of Acid-Drainage Regulations. Panel discussion by Larry Cook, chairman, Coal Industry Advisory Committee to ORSANCO; Ernest P. Hall, Henry Hebley, L. E. Sawyer, CIAC members.

By accepting the stream-pollution control regulations adopted by the Ohio River Valley Water Sanitation Commission Jan. 14, 1960, the Coal Industry Advisory Committee to this group has committed the industry to full cooperation in reducing acid drainage from mines and preparation plants and in seeking final solutions to the problem.

Cooperating to reduce acid drainage at the present time boils down to these main jobs: (1) keep water out of mining areas as much as possible, (2) keep drainage moving, (3) segregate sulfuritic materials, (4) neutralize acids in preparation-plant effluent and in "casual" standing pools, and (5) practice good housekeeping.

CIAC and ORSANCO are in general agreement that Resolution 5-60 is sound, practical and something the industry can live with. It should be borne in mind, however, that individual states can scale up minimum requirements set by ORSANCO, if they see fit.

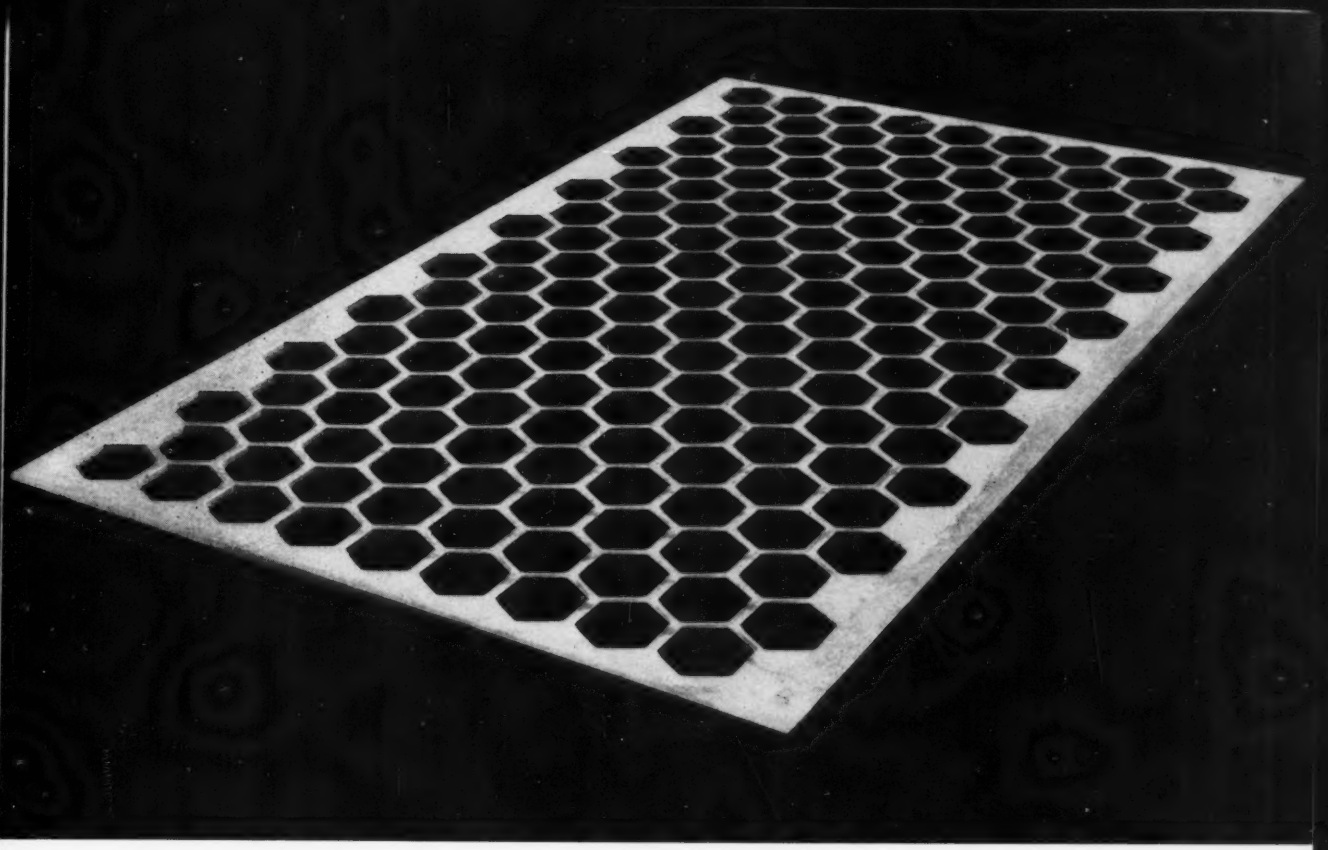
Some companies still feel they would like to circumvent the new controls but this is unwise as the measure is reasonable, and, without cooperation in compliance, tougher, punitive measures could follow. All companies should strive to comply with the new regulations to the fullest.

Where operators have problems, they should get in touch with CIAC. We will give advice and guidance although we can not provide engineering aid and service. CIAC, in turn, wants to know what individual operators are doing and would like to be fully informed on costs and other relative particulars.

From the floor, **Stephen Krickovic, Eastern Gas & Fuel Associates,** and a CIAC member, stressed that each operator should analyze his own problem. Before he knows what he can do, he must first determine conditions surrounding the problem—drainage system, volume of water flow, acid content of water before and after it passes through property, etc.

F. W. Montanari, sanitary engineer, ORSANCO, remarked it was a distinct pleasure to see the coal industry taking a positive attitude toward the acid-drainage problem. This new approach, he added, marks a turning point in the history of water conservation and control in the Ohio River Valley area.

[Ed. note: Readers are urged to check the *Coal Age* feature, "Acid Drainage Controls Are Here," April, 1960, p 80, for the complete story on the new regulations—what they are, what they mean and what to do about them.]



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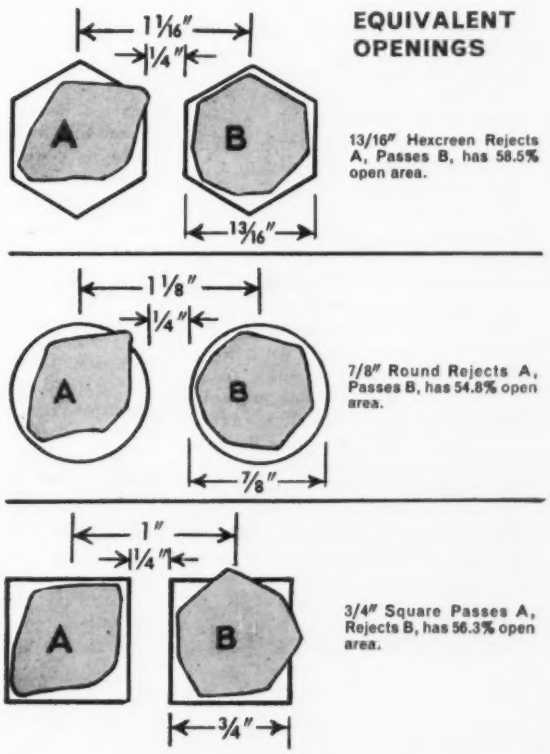

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Foremen's Forum

Fundamentals of Technology

What should be the position of the individual in today's large scale organization?

What should be the real relationship of technology to the individual and to society as a whole?

By **Henry B. DuPont**, Vice President E. I. DuPont de Nemours & Co.

IF OUR YOUNG PEOPLE are deriving less from their exposure to education than they should, I think it is because they have fallen victim, along with many of their elders, to the philosophy which for many years held that success by one's own efforts is less to be desired than a collective security—a philosophy which, in a word, has suggested that the world owes everyone a living and cost-free care from cradle to the grave.

It is true that the advocates of this doctrine constitute a minority, but it is unfortunately a highly vocal minority. And it is sometimes astonishing how much effort can be expended in seeking something for nothing! One would wonder how productive such energy might be if turned to more creative purposes.

To some extent, the persistence of a something-for-nothing theme may be traced to the fact that, for a hundred years, we have been subjected to a barrage of propaganda from Communist sources—propaganda so enormously subtle and deceptive that it frequently finds a voice in the very people who have most to lose by it. The Marxist preachings that dampen personal ambition proclaim that achievement has no virtue in itself, for men are simply the pawns of economic developments which happen despite them. The Marxists argue that there is little to be gained by aspiring to excel, and that a self-perpetuating security is more in keeping with modern thought than individual accomplishment. **It is notable that, while the Communists urge such ideas upon us, they have set up quite a different system in the Soviet Union and in Red China. In their own bailiwicks, in other words, they insist upon a high standard of individual performance.**

It would be comforting, I suppose, if we could close the inquiry here and conclude that our departure from basic American principles stems wholly from the big bad Communists. Unfortunately, I don't think we can escape that easily. I wonder if our difficulties do not have some part of their origin in the fact that we have become bewildered and confused about the essential nature of our own society. Perhaps the real failure of our educational process has been difficulty in making clear the major elements of our national strength.

There are two vital areas of the American success story which have become subject to much misinterpretation. **First, we misunderstand the role of the individual in relation to the large-scale organizations which have become essential parts of our society. Second, we have misunderstood the relationship of technology to the individual, and to society as a whole.**

The growth of large industrial organizations in recent years has generated a number of fanciful illusions. Because the scale of our enterprises today demands large organizations to meet the great financial and technical requirements, many observers seem to conclude that the individual has become lost in the crowd and is no longer essential. Nothing could be further from the truth. **Creative thinking is the province of the individual—as much so today as ever before.** Association with a group does not relieve anyone of personal responsibility or the need for individual initiative, nor does it deprive anyone of personal identity. Those who would clearly understand our modern society must study well the role of the individual within the format of organizational effort.

Most of our large corporations, as a matter of fact, come into being as the result of one individual's faith and daring—frequently in attempting something that others thought impossible. The Du Pont Company followed this pathway a century and a half ago, and, if anyone believes that it is a pattern long outmoded, I can point to a number of relatively new firms in new industries, such as aircraft, in which great companies are the living shadows of contemporary individuals—men like Juan Trippe of Pan American, Donald Douglas of Douglas Aircraft, and so forth.

A second element that lies close to the core of our national problem is the growth of our technology, at a rate which sometimes blurs the outlines of its true form. If our technology is to continue as the source of national strength and the source of popular well-being, it is of extreme importance that we understand it for precisely what it is—and even more precisely for what it is not.

Technology is a term which is frequently applied loosely, and sometimes erroneously. It means actually, more than scientific development, more than engineering achievement, more than mechanical force or the harnessing of energy. Technology is, in fact, the sum total of all the tools and techniques which men have enlisted to multiply human effort since the beginning of time. **We think of "technology" as a modern term and a modern development, but the fact is that the wheel, the lever, and the crossbow were technological accomplishments of much significance long before anyone recognized them as "technology" as we use the term today.**

Modern technology is a force which brings together machinery and equipment, skills and techniques, men, money, and methods. Let us not undervalue its importance; technology is the back-yard gold mine of every American. Our technological progress is, in fact, a national bonanza which has enriched all beyond the dreams of the sourdough prospector, and its potential for further gain is even brighter now than in the past. It is a force which transforms deserts to gardens, poverty into plenty, despair into hope. It has extended the range of man's vision to vistas on the other side of the sun; his ear, which once heard little be-

Abstracted from a speech by Mr. DuPont on the occasion of the dedication of a new science building at Sul Ross State College, Alpine, Tex., May 2, 1960.

Interim Progress Report on CF&I-Wickwire's new wire rope

DOUBLE GRAY-X®

Falcon Seaboard Drilling Company orders carload

The first company to use a prototype of Double Gray-X was the Falcon Seaboard Drilling Company of Tulsa. Aware that modern drilling practices demand the best possible equipment, Falcon Seaboard tested Double Gray-X on some of their rotary drilling rigs, an operation that subjects ropes to extreme abuse. Mr. Jack Starr, Vice President in Charge of Drilling, commented, "The results obtained from original tests with Double Gray-X prototype led to our decision to order *a carload of this improved product.* Falcon Seaboard insists on the best products, in order to serve the oil industry in accordance with today's modern standards."

The Secret of Longer Rope Life

CF&I-Wickwire engineers, after intensive research, discovered that by using an entirely new wire drawing technique—including the use of Molysulfide* in the lubricant—the characteristics of the wire rope were greatly improved. This method creates a permanent molecular jacket around the individual wires that provides these benefits:

- **reduced friction between the individual wires in each strand of Double Gray-X during service**
- **minimized surface imperfections in the wires of Double Gray-X**
- **wires have greater resistance to abrasion, crushing and bending**

If you are a user of wire rope, you can *increase* the safety of your operation and *reduce* equipment downtime with Double Gray-X. Made in a wide variety of sizes and constructions, Double Gray-X is recommended for all types of equipment. For complete details on this new wire rope, call the nearest CF&I sales office or see your local distributor.

Greater Strength

The molecular shield around this new premium wire rope gives Double Gray-X longer life. In addition, you get the *extra strength* for which Double Gray has always been famous. Made of extra improved plow steel with an Independent Wire Rope Core of the same material, this rope gives 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.

*Registered Trademark of Climax Molybdenum Co.

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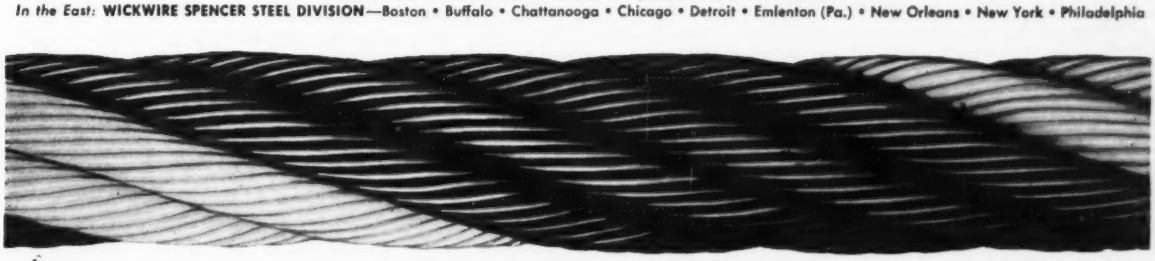
WICKWIRE ROPE

THE COLORADO FUEL AND IRON CORPORATION

In the West: **THE COLORADO FUEL AND IRON CORPORATION** — Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Farmington (N. M.) Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Odessa (Tex.) • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City San Francisco • San Leandro • Seattle • Spokane • Tulsa • Wichita

In the East: **WICKWIRE SPENCER STEEL DIVISION**—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia



yond the cry of the birds, today records impulses originating a million miles away in outer space. Man with technology at his elbow is a Superman indeed.

But technology has its limitations as well as its wonders, and I suspect that part of our difficulties today arise because we have been led into a technological booby trap. For we have not as yet discovered a push button which will automatically bring us riches without effort or grace without understanding.

Technology abounds with temptations. Because it is easy to ride, we hesitate to walk. **Because we can employ tools, we forget that they were fashioned to aid, not to replace, the human hand.** Because we can reach far into the sky, we overlook the fact that our roots and our responsibilities are here, deep in the earth.

On the surface, it would seem that automatic machines have some unusual advantages over human effort. They can operate under conditions which would discourage any labor force, however eager. Compared with the normal intake of the human system, they require inexpensive and unvaried fuel, they work long hours without fatigue or complaint, and can be repaired at a fraction of the cost of mending the human frame. So far as is known, no machine has yet required psychiatric attention, a pat on the back, a day off for attendance at its grandmother's funeral, or a coffee break.

These admirable qualities often lead the unwary to forget that machines, too, have weaknesses and, unlike man, do not have the means at hand to correct them. They are, in fact, subject to one of the most deadly diseases ever to strike an economic undertaking. **For machines are susceptible at all times to the insidious blight of obsolescence.**

Obsolescence is an ailment for which the only cure is continual improvement. Mechanical victims, unfortunately, lack the resilience with which men have learned to survive through centuries of existence. Machines cannot always be retrained or reoriented when their day is done; they cannot always rise from the floor and face life anew. For no machine ever devised has acquired the great human virtues of courage, faith, and resolution in the face of adversity.

Occasionally, we have seen shortsighted management of some business venture put its whole trust into machines and try to hold back the tide of obsolescence by ignoring or standing aloof from new ideas. Few such firms have lasted beyond the day when they discover that, while men can rise from the ashes of disappointment and disaster, the future of the displaced or outmoded machine lies only in the useless scrap heap. **Man, happily, has yet to become obsolete.**

I suspect that some of our problems lie in our use of science as a crutch, as a mechanical device to relieve the world of the necessity for human judgment. Too many of us, I am afraid, rely upon our calculators and our mathematical formulae to chart our course in advance, to prove our case before trial, and to insulate us, in fact, against all risk.

I regret to say that we in industry also fall victim all too often to such temptations. **We seek to apply scientific means and scientific methods to areas in which science is as helpless and out of place as a wild guess in a countinghouse.** In launching a new business venture, for example, we all too frequently depend upon a pretested market, only to find that, by the time decisions are made and preparations completed, conditions have changed and our carefully contrived plan is twisted askew.

The fact is that the country was not built by timid souls whose future could be guaranteed, or those who could measure the degree of risk to which their ventures might be exposed. It was built by those whose intuitive grasp of opportunity was over and beyond statistical need; by those who backed their cast of the dice with courage, with faith, and with resolution.

Most of our country's progress has come through a spirit of boundless confidence and optimistic disregard of the consequences of failure. There is hardly a successful venture in our history, industrial or national, against which excellent arguments, highly logical arguments, could not have been advanced at the outset. Undoubtedly, there were sound reasons why the transcontinental railroad should not be built, why the Homestake Mine should not be opened, or why the settlements beyond the Ohio should never have been attempted. **I can cite from my own experience the fact that there were extremely plausible pleadings advanced to the effect that the DuPont Company should not enter the field of dyestuffs or the field of fundamental research or the field of synthetic textile manufacture.**

Fortunately, the optimist has always prevailed. Progress is never the product of pessimism. Vigorous institutions in science, in business, in government or the arts, are monuments to affirmative thinking, not to the sober head-shaking "no."

We can be grateful that in America the Ayes have always had it. Much of our progress, it must be said, has come about because dreams have triumphed over cautious reality; because the poetry has proved more persuasive than the prose.

Which brings us back, as it must, to the individual, for dreams are personal property of an exclusive sort, and faith, courage, and resolution respond always to individual inspiration. It is the responsible individual's role to evaluate the scientific tools at hand to the end that our technology is seen not as an end, but as a means; not as a substitute for human creation, but as its handmaiden; not as a replacement of reason, but as a result of reason.

A Safe and Sane Vacation

DURING the miners' vacation later this month many of you will pack up and take to the byways or your special resorts for a well-earned vacation. We hope you thoroughly enjoy your holiday, and that you return refreshed and invigorated.

However, we beg that you take your safety sense with you as you leave on your vacation. We need our readers, every one of you.

Don't speed. Thousands of tourists will be killed on our highways this summer, sad but true. Don't be among them. Drive with common sense at reasonable speed in complete compliance with traffic regulations. Be sure your car is in good mechanical condition before you start, don't overcrowd the vehicle and don't mix alcohol with gasoline. Give yourself plenty of time to get from place to place.

If fishing is for you, look before you cast so you won't snag a plug in somebody's scalp. Be careful around boats, especially if you have youngsters with you. Don't spoil your vacation by overexposing yourself to the sun, and watch the young ones on this score. You would be prudent to prepare a well-stocked first aid kit, although we hope you will not have to use it.

Now, don't day-dream about your approaching holiday during working hours. It has been noted that approaching holidays sometimes lead to a relaxed attitude towards safety. Watch for signs of similar preoccupation among your men. Don't permit them to take chances, even if you have to bear down a little bit.

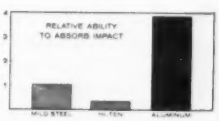
TEC dumper earns $28.00 per day extra thanks to ALCOA ALUMINUM

The TEC Division of The Heil Company, Cleveland, Ohio, has built nine aluminum dump trailers like the one pictured above for Arrow Trucking, Inc., also of Cleveland. And TEC couldn't have a more satisfied customer. This is because construction of Alcoa® Aluminum enables each unit to haul 56,000 lb of coal versus 49,000 lb for a comparable steel unit, per Ohio law.

Alcoa Aluminum Drop Center Forged Disc Wheels on the trailers and tractors account for almost 500 lb of extra payload and provide better handling, better brake life and less front-end maintenance. And payload is further increased by extensive use of aluminum in the Autocar Model A-10264 Tractors, which eliminates at least 1,500 lb of dead weight.

Arrow has a contract to deliver coal to a large public utility, and all nine units are currently kept busy six days a week on this account. While making only four trips a day (167 miles average round trip), the extra payload provides increased revenues of $28.00 per day per unit. That's better than $7,780.00 per year added profit on each trailer! Obviously, it doesn't take Arrow long to write off the slight additional premium paid for aluminum.

The corrosion problems that have always plagued coal transporters come to an end when they switch to aluminum bodies. Leading manufacturers are ready to bring you these advantages by fabricating dump bodies of Alcoa Aluminum to your specifications, or by supplying economical standard designs. For more information and the names of manufacturers near you, write: Aluminum Company of America, 1776-F Alcoa Building, Pittsburgh 19, Pa.



PROOF! *Aluminum is actually tougher than steel!* Dump bodies built of Alcoa Aluminum can take *three* times the impact of steel—at *half* the weight!

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and "Alcoa Theatre" alternate Mondays, NBC-TV

Operating Ideas

Mechanized Welder Speeds Track Rebarring

A 33% SAVING in man-hours required to replace a set of worn grouser bars has been realized from the installation of a mechanized Lincoln Electric ML-3 "Squirt" welding unit at the plant of Carolina Tractor & Equipment Co., Salisbury, N. C. The company is a leading Caterpillar dealer and rebuilder of western North Carolina.

Grouser bars were formerly installed by manual welding with low-hydrogen electrode. A single pass across one side of a new 18-in bar required 3 min 10 sec arc time. Now, with mechanized equipment, a pass can be made in 49 sec arc time. The welding gun is self-propelled, with built-in motor drive. Flux is deposited continuously from a container on the gun, which moves along the joint at the speed of 22 in per minute.

The welding unit is compact and portable, with power supply and electrode-wire feed in an integral unit. It can be adapted to many other routine welding jobs where high speed and minimum operator skill are combined.

Power Shifting Boosts Dozer Production

By **T. J. Zarse**
Market Division
Caterpillar Tractor Co.
Peoria, Ill.

TEST FIGURES indicate that the recently introduced power-shift transmission offers a dozing production advantage of up to 27% over that possible with direct-drive tractors equipped with a constant mesh transmission.

Laboratory and field tests conducted during development stages of the new transmission had indicated that tractors equipped with it could move considerably more dirt per work unit. Seeking an answer to the question of how great an increase could be expected, Caterpillar conducted a study at its demonstration area near Peoria. Two new 235-hp tractors, one equipped with a direct drive and the other with a power-shift transmission were used.

Dozing distances of 50, 100 and 150 ft were staked off in pairs. In each instance, the pits were side by side to insure that soil conditions would be similar. As a further control, the same operator was used on both machines to eliminate the possibility of operator differences.

Each tractor was run through 17 complete cycles with time information recorded for all phases of each cycle. This number of passes was chosen because it produced the largest hole practical in a 50-ft pit. Volume of each pit was determined by cross-sectioning.

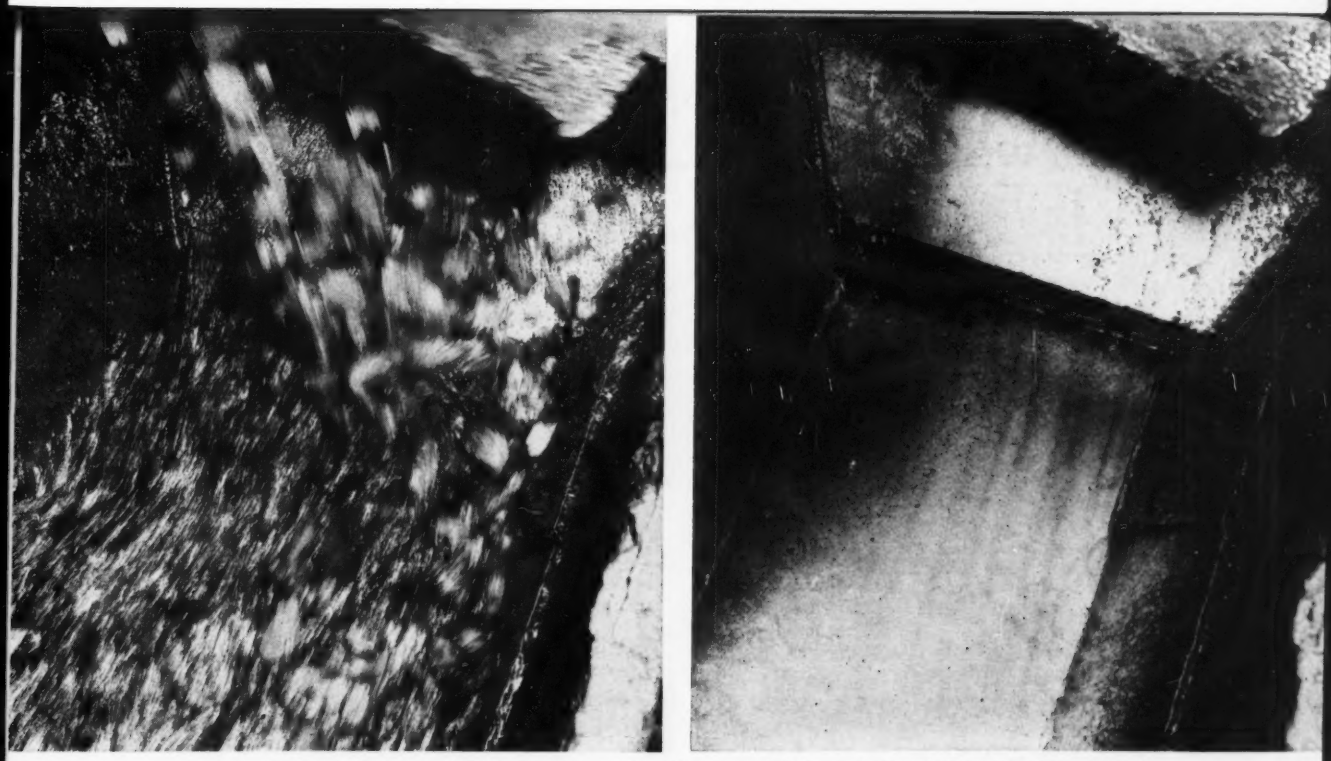
Working gears used by the tractors in all elements of the test were: direct drive—cut and doze, second; reverse, sixth; power shift—cut, low; doze, second; reverse, third.

An examination of Table 1 shows that in the 17 passes each machine moved approximately the same volume of dirt, with a slight advantage going to the power-shift machine. The power-shift tractor moved an average of 4.52 yd per trip and the direct-drive tractor an average of 4.49 cu yd. Further study of the production figures shows that as the dozing distance increases, the power-shift machine gains an increasing advantage over the direct-drive machine.

The table of cycle times shows that the power shift saved time by practically eliminating shifting time and by reducing the doze time. The ease of shifting enabled the operator to upshift when the blade was full and carry the material to the fill in a higher gear. To do this on the direct-drive machine, it would have been necessary to stop, shift and start again. This maneuver would have lost more time than if the whole distance had been dozed in the cutting gear.

Table I—How Production and Cost Figures Compared in Direct-drive and Power-shift Dozer Tests

	Doze Distance (ft), 235-hp Tractor					
	50		100		150	
	Direct Drive	Power Shift	Direct Drive	Power Shift	Direct Drive	Power Shift
Cut	0.33	0.35	0.40	0.37	0.35	0.35
Doze	0.37	0.31	0.64	0.45	0.92	0.66
Shift (F to R)	0.04	0.01	0.04	0.01	0.07	0.01
Reverse	0.24	0.27	0.33	0.32	0.39	0.42
Shift (R to F)	0.09	0.01	0.08	0.02	0.11	0.02
Total Cycle Time (Avg)	1.07	0.95	1.49	1.17	1.84	1.46
Cycle Time (17 passes)	18.20	15.80	25.43	20.43	30.79	25.25
Material Moved (bcy)	81.9	84.5	72.0	68.7	74.25	77.6
Production (60 min/hr)	270	319	170	202	145	185
Production increase— Power shift over direct drive		18.1%		18.8%		27.6%



Processing plant of Oriole mine. USS "T-1" Steel pays dividends in longer chute life, under the grinding action of coal and rock.

Chutes of USS "T-1" Steel outlast others 3 to 1

Coal and rock scraping across a piece of metal are highly abrasive. At the Bell and Zoller Coal Company's Oriole Mine near Madisonville, Kentucky, gravity chutes lasted about three months.

Then Oriole switched to USS "T-1" Steel furnished heat treated to a minimum hardness of 321 Brinell. In this harder condition "T-1" Steel offers maximum resistance to impact abrasion, yet retains toughness and weldability. Their new chutes lasted nine months to a year. The extra cost of "T-1" Steel was wiped out almost immediately by the sizeable saving in the costs of material and fabrication, and by the extended life of the new chutes.

Now, USS "T-1" Constructional Alloy Steel, at 321 minimum Brinell, is used for all sluice and refuse chutes in the Oriole processing plant. More than 3,400 tons of coal and rock go banging and clanging down the chutes daily. Despite impact, abrasion and corrosion, the ⅜-inch-thick plates of "T-1" Steel stay smooth and clean. Coal doesn't clog the chutes.

Other uses where "T-1" Steel saves money. "T-1" Steel's great strength (100,000 psi minimum yield strength), its resistance to impact abrasion and its toughness, even at 50 below zero, make it truly mining's metal. Shovel buckets can be built larger and lighter to scoop more load, truck bottom plates take more battering when made of "T-1" Steel and last longer. Continuous miner front ends, conveyors, vibrator frames—all withstand punishment better and reduce maintenance costs when made of USS "T-1" Constructional Alloy Steel.

United States Steel makes steels of high strength levels for a wide variety of applications: USS "T-1" Steel (100,000 psi minimum yield strength), USS COR-TEN, USS MAN-TEN, USS TRI-TEN brand steels (50,000 psi minimum yield point), in addition to a complete range of carbon and stainless steels. For more information about USS "T-1" Steel, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS, "T-1", MAN-TEN, COR-TEN and TRI-TEN are registered trademarks

This mark tells you a product is made of modern Steel

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
National Tube—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

Operating Ideas (Continued)

Table 2—How Owning and Operating Costs Compare for Power-shift and Direct-drive Dozers

	Direct Drive	Power Shift
Total Cost	$40,100	$43,135
Depreciation Period (5 yr)	10,000 hr	10,000 hr
Depreciation per hour	$4.01	$4.31
Interest, insurance, taxes	1.20	1.29
Fuel, lubrication, grease	1.33	1.33
Repairs (90% of depreciation)	3.61	3.87
Operator's wages	3.00	3.00
Total	$13.15	$13.80

The power-shift machine also shifts faster than the direct-drive machine. Even when the direct-drive unit was handled by an expert the power shift save an average of 0.04 min (2.4 sec) shifting from 2nd forward to 6th reverse, and 0.07 min (4.2 sec) going from 6th reverse to 2nd forward.

Since the shift cycle could be repeated as often as 400 times in a 10-hr day, it is easy to see that at the end of the day the operator of a power-shift machine will be considerably less fatigued than the man on a direct-drive tractor. The fatigue factor is usually expressed in terms of operator efficiency, or productive time. For this reason it is customary to estimate the productive time of a direct-drive machine at 50 min per hour. Taking into account the considerably less effort required with the power-shift transmission, there is reason to believe that in the future the productive time of machine equipped with this transmission option will be estimated at 55 min per hour. If these figures are used, the production advantage of the power shift over the direct drive will be as shown in Table 3.

Table 3—Production Advantage of The Power Shift Over The Direct Drive Dozer

	Doze Distance (ft), 235-hp Tractor					
	50		100		150	
	Direct Drive	Power Shift	Direct Drive	Power Shift	Direct Drive	Power Shift
Production per 55-min hr (bcy)	...	292	...	185	...	170
50-min hr (bcy)	225	...	142	...	121	...
Production increase, Power shift over direct drive		29.8%		30.3%		40.5%
Cost per cu yd (cents)	5.85	4.73	9.26	7.46	10.87	8.12
Cost advantage, power shift over direct drive		19.2%		19.4%		25.3%

How to Save Time, Money on V-Belts

By **Alvin W. Spicer**
Head, V-Belt Field Engineering
B. F. Goodrich Industrial Products Co.
New York, N. Y.

IT'S BEEN SAID that more V-belts are permitted to commit suicide than are allowed to live to a ripe old age.

The company not getting 2 or 3 yr service from belts is allowing this part of its equipment to kill itself before its time.

It is the responsibility of a belt manufacturer or his sales representative to make sure each V-belt is properly engineered to its application. And it certainly is to the advantage of the user to have his maintenance or engineering people spend a little extra time with the belting expert to make sure all the information needed to specify the proper belt is available.

Although they may all look the same on the outside, V-belts are manufactured in a wide range of types, each designed to perform at optimum efficiency under a particular set of circumstances. The manufacturer can recommend the proper belt only when he knows the type of driver unit, type of driven unit, speed of belt, horsepower to be transmitted, type of service (intermittent or continuous), type of load (steady or pulsating), ambient operating temperatures, center distances available, and sheave size limitations.

Once the belt is properly applied, it's up to the owner to see that it's maintained properly. "Suicidal tendencies" should be checked for at regular intervals and corrected as soon as they are spotted.

Here are some checkpoints recommended by B. F. Goodrich which, if followed, will guarantee long belt life and optimum efficiency:

1. Misalignment of sheaves. Belts are made to ride upright in the sheaves; misalignment will cause belts to turn over.

2. Worn or broken sheave flanges. Worn sheave grooves create differential driving of the belts, i.e., one belt may pull more of the load than the other. Broken sheave flanges tear up the belt sides and cause excessive wear.

3. Shorten temporarily the center distance when installing new belts. Running or prying belts on may cause permanent damage by rupturing the covers and load-carrying members in the belts.

4. Install belts under proper tension and recheck belt tension periodically, tightening belts if necessary. Refer to belt manufacturer's bulletin to determine method of checking for proper tension. The horsepower transmitted by belts is dependent upon the total tension. If this tension is not maintained the belts will slip, flop or vibrate excessively, turn over in the sheave and generally perform unsatisfactorily and inefficiently.

5. Provide belt guards to prevent foreign material from falling onto belts or into sheaves. When installing guards, however, provide ample clearance so that belts do not snag or drag on the belt guard. Also provide for easy removal of guards so that belt tension can be readily checked.

6. Do not allow belts to run turned over. The drive may still operate under these circumstances, but it will only bring about early failure.

7. Do not use belts from different manufacturers on the same drive. The physical characteristics of belts from one manufacturer differ from those of another manufacturer to such an extent that seldom, if ever, can they be intermixed successfully on the same drive.

8. Do not set up a drive with "long" belts. If at initial installation of a set of belts, 80% or more of the take-up is used, it is well to question your supplier concerning the availability of shorter belts. Good belting practice dictates a take-up allowance so that belts can always be maintained at proper tension.

9. Do not install one or two new belts into a set of older used belts. Replace the entire set if one or two belts fail or are damaged. The remaining good "used" belts can be saved and matched into a set with other "used" belts. talk this over with your supplier who will normally have a belt-matching machine and can perform this service for you.

Industry-proved through a quarter century of service...THERE'S NO DOUBT ABOUT NEOPRENE

HEAT:

What are the limitations of your trailing cable?

Reel up layer-on-layer of trailing cable on a mining machine and heat can become a really serious problem . . . especially in the inner layers where it can't be dissipated quickly.

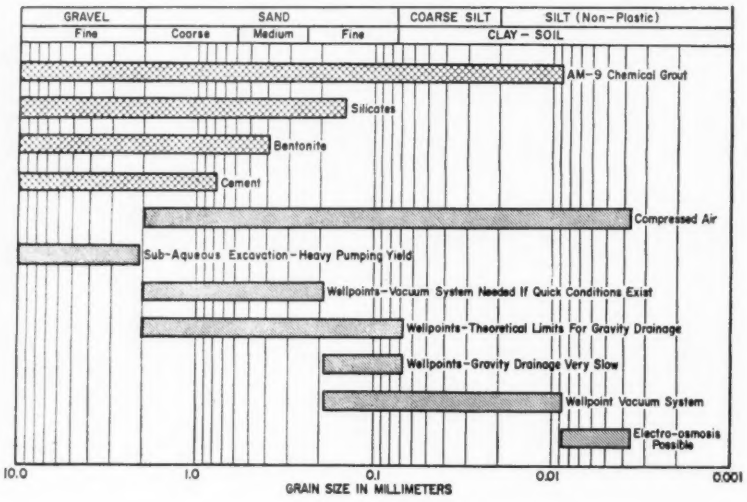
Some cable jacketing materials can't take heat. They soften. They get squeezed out of shape and take a permanent set. They frequently lose their tensile strength, resilience and their ability to withstand abrasion and impact.

Not neoprene synthetic rubber. It retains its unusual combination of properties at temperatures as high as 250° F. . . . will work satisfactorily if the temperature occasionally goes even higher. Combined with its resistance to acid water, oil, grease and physical abuse, this makes neoprene your surest cable jacketing investment. Remember, all of its properties have been *proved* through 25 years of electrical service. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department, Wilmington 98, Delaware.

DU PONT NEOPRENE

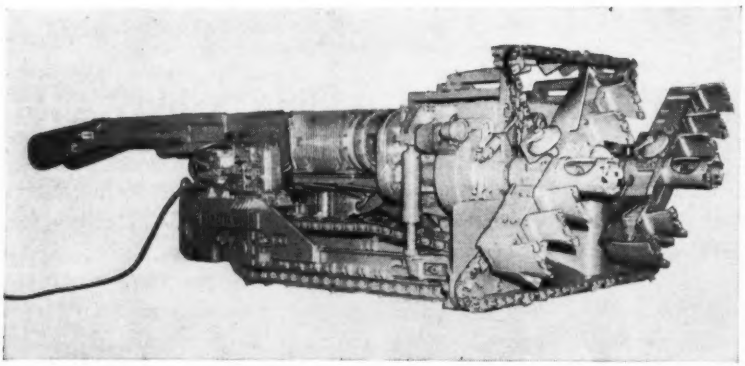
Better Things for Better Living . . . *through Chemistry*

Equipment Developments



Better Soil Control

A chemical that turns water into a stiff continuous gel in a controlled period of time is the key to a new concept of soil stabilization and grouting, declares American Cyanamid Co., New York 20. Called AM-9 chemical grout, the material is pegged for use with a patented process in the mining and construction industries to prevent water seepage. After addition of a catalyst, an aqueous solution of AM-9 is injected through the soil or rock formation. Gelling time is controlled from a few seconds to several hours, depending on the distance the solution must penetrate. When it gels, AM-9 not only stops passage of water through the mass, but also binds together soil particles, sand or loose rock, providing an increase in shear strength. The chemical is said to be especially suited for solidifying weak, granular soil masses during tunneling operations and in many types of shafts and excavations. The new product, 7 yr in development and field testing, comes as a dry white powder. It may be mixed with cement, sawdust, dyes and thickening agents to modify the properties of the solutions and resulting gels.



Adjustable Miner

A new group of Marietta continuous miners permits height adjustment for different conditions without loss of rigidity, reports National Mines Service Co., Pittsburgh 19. The machines are crawler-mounted boring-type units with capacities of about 8 tpm. National Mine cites, as an example of its new "Dual-Range" height control, a machine adjustable through a low ramp of 6 to 7 ft, and a high range of 6 ft 6 in to 7 ft 6 in, a total of 6 ft to 7½ ft overall. Adjustments within either 12-in ramps can be made hydraulically in minutes from the operator's station, including adjusting top and bottom trim chains, positioning rotor arms and adjusting trim jacks, according to the firm. Shifting from one range to another is a mechanical adjustment which can be done on the job with a few hours. Other design features of the miners, labelled Series II, include: separate motors for each of the two cutting heads and the hydraulic system; extremely broad throat; unique accessibility for maintenance; and advanced support design which provides stability and concentrates mass against the working face without the aid of jacks.

SOFT GREASE—Lehigh Chemical Co., Chestertown, Md., is marketing a synthetic anti-seize compound for extreme high-temperature applications. Called Anderol L-751, it is a mixture of a thermally stable silicone oil with a solid-type lubricant blended to the consistency of a medium soft grease. Its excellent thermal stability and anti-weld properties meet the requirements for high-temperature ranges of 400 to 600 F, according to the firm. Anderol L-751 comes in 1- and 5-lb cans, 14-oz cartridges and 35-, 100- and 400-lb drums.

ROCK BOTTOM EXPLORATORY COSTS

RESULT IN REPEAT ORDERS TOTALING 11 UNITS FOR MID-WEST COLLIERY

REICHdrill T-400 supplies exploratory information fast

One of the largest, most efficient collieries in the Mid-West found that in exploratory drilling they could obtain a reading of overburden, rock strata, and coal measures in record time using the T-400 REICHdrill. This all-hydraulic top-drive rotary rig can drill up to 6" diameter holes and can take cores from depths of more than 3,000 feet. And it moves from hole to hole fast and easy. Costs? Rock bottom!

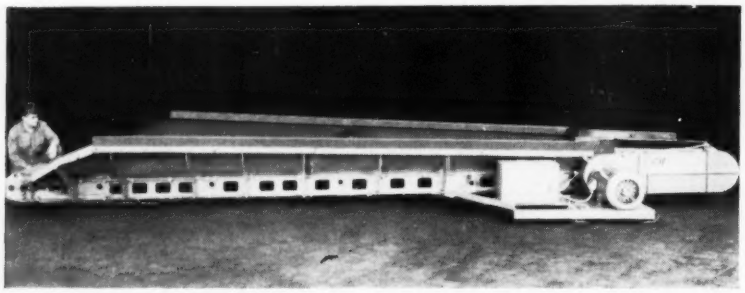
So they repeat-ordered 10 more REICHdrills. Their operators like the T-400's exclusive lever-type mast construction. Applies full pressure of 10,000 pounds directly over rod and offers continuous 12-foot stroke.

Other REICHdrill features include: fast, easy adjustment of rotary speeds and down-pressure for optimum penetration and bit life in all formations . . . direct drive to drill stem that saves power loss . . . no complicated transmission, no rotary table, no kelly means in and out of the hole faster . . . instant safety torque release protects all drive components, saves rotary and diamond bits, core barrels, and drill steel.

For further information write:

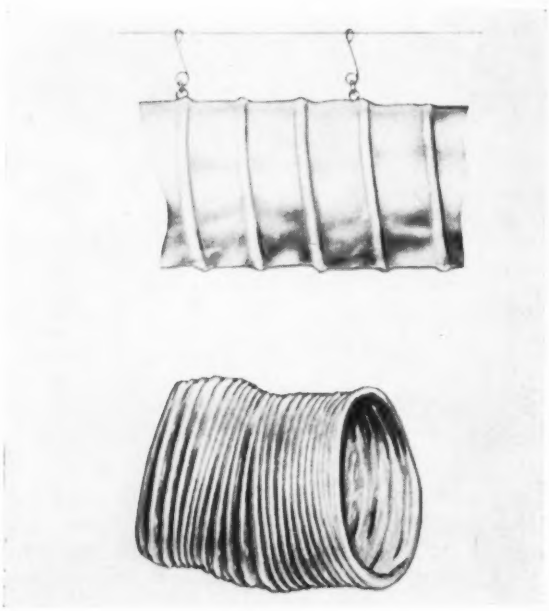
REICHdrill
HOWARD STREET, FRANKLIN, PENN.
Division: CHICAGO PNEUMATIC TOOL CO.

REICHdrill Model T-400 is truck-mounted, hydraulic-powered. 12-foot continuous stroke. Down pressure: 10,000 pounds. Water pump: 35 g.p.m. and 225 p.s.i.



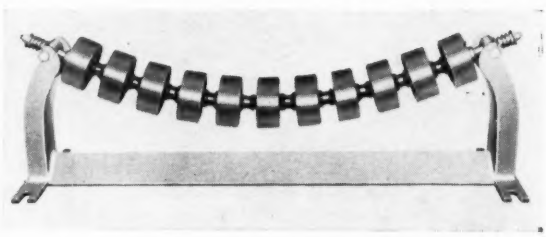
Low-Headroom Feeders

Two new sizes of Ratio-Feeders for use in thin seams down to 30 in are announced by the Mining Equipment Div., Columbus McKinnon Chain Corp., Tonawanda, N. Y. These units complete the firm's line of Ratio-Feeders, ranging up to 15-ton storage capacity. The feeder is a chain flight conveyor used to load belt conveyors. It takes material from the shuttle-car at the car's highest discharge rate and meters it at a controlled rate to the belt. Besides speeding up the shuttle-car operation, Ratio-Feeders prevent belt overloading, spillage and damage, notes the firm. The new RF-40 series features 24- and 30-in overall height with capacities from 2½ to 3¼ tons. The models feature more accessible controls, refined output adjustment and compact structure. Machines are available as permissible equipment with either AC or DC components. One rugged-size drive chain is standard on both models, adds the company.



New-Type Tubing

American Brattice Cloth Corp., Warsaw, Ind., now has "MineDuct," a new type of flexible ventilation tubing. Made for exhaust ventilation under high negative pressures, this spiral wire-reinforced tubing is reported to be excellent for blower ventilation where corners and sharp turns are involved. MineDuct is a spirally-wound tube made from Neoprene-coated cotton fabric and steel wire. The wire is covered on the inside and outside of the tube and is wrapped within the wire. Features cited are flame resistance, flexibility, airtightness, strength and lightness and retractability. Yellow for added visibility and exterior safety underground. MineDuct will perform within a temperature range of —40 to 250 F, adds the manufacturer.



Conveyor Carrier

Stephens-Adamson Mfg. Co., Aurora, Ill., is marketing a new catenary conveyor carrier called "Flexiroll." The firm says this carrier gives true catenary suspension for conveyor belts under all load conditions. Flexiroll features a high-tensile spring-steel "dead shaft" to which is mounted a mild-steel trunion and a shock-absorbing compression spring. The shaft has a set giving a trough that enables the most rigid belts to make contact with the face of all rollers when the belt is running under various load conditions, says the firm. The result is that the carrier supports the belt in a natural arc, with reduced belt wear. The carrier rollers resist reaction to corrosive, abrasive or combustible materials. Natural flexing action reduces material breakage, spillage and build-up.

Get Right Torque

A special indicator-type torque wrench for use in mines and jobs calling for close-quarter, uniform tightening is being marketed by Apco Mossberg Co., Attleboro, Mass. The 2DF-300

B.F.Goodrich

These B.F.Goodrich tires help haul 200,000 tons of coal a month

THIS unit is one of a fleet that hauls 200,000 tons of coal a month out of a strip mine in Ohio. Ahead is an 8-mile trip to the dump on a road made of shale and crushed rock. Payloads run to 50 tons and over. For this rugged work, the company uses B.F.Goodrich Rock Service tires.

Now you get even longer service from Rock Service tires, thanks to 2 amazing new B.F.Goodrich compounds. Only B.F.Goodrich builds tires that are actually *tailor-made* for your type of work.

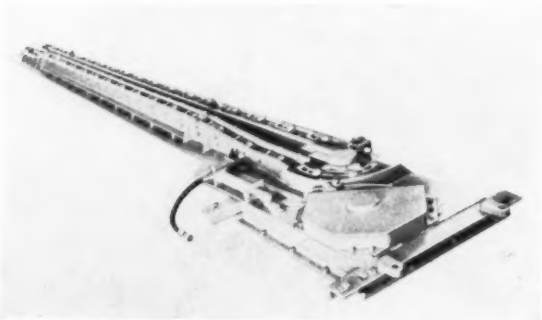
For jobs where rock cutting and chipping are problems, B.F.Goodrich developed the Cut Protected compound. For jobs with dangerous heat build-up, B.F.Goodrich developed the new Heat Resistant compound. These new tires, and the regular Rock Service, have the B.F.Goodrich FLEX-RITE NYLON cord body that withstands double the impact of ordinary materials. Result: You get more retreadable tires—more retreads per tire.

Get the Rock Service tailor-made for you from your B.F.Goodrich Smileage dealer. He's listed under Tires in the Yellow Pages of your phone book. *The B.F.Goodrich Company, Akron 18, Ohio.*

Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

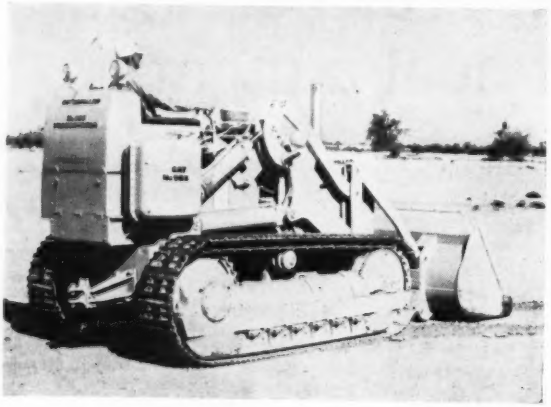
B.F.Goodrich *off-the-road tires*

torque wrench is ideal for applying precise torque to fastener bolts on mine support timbers and maintaining proper tension on interconnecting cables, according to the firm. Since safety regulations specify frequent inspection of torque loads on fastener bolts, accurate tightening and measuring with the 2DF-300 help keep service loads below endurance limits, minimizing fatigue failure caused by repeated load adjustments, declares Apco. The large 3-in dial is mounted on the side of the handle for easy reading. Handle movement of ½-in or less will give full reading on the unbreakable crystal dial. A ¾-in. drive fits all sockets. Reversible drive plug permits measurement left or right, from 0 to 300 ft-lb.



Car Control

"Hold-A-Trip," made by Nolan Co., Bowerston, Ohio, facilitates regulating the flow of mine cars going up or down a slope. Designed especially for use with hydraulic mine-car pushers, the device prevents mine-car drift on downgrades, assures accurate car spotting and eliminates use of wheel skids, reports Nolan. Quickly installed, Hold-A-Trip rests on mine ties with 30,000 lb of holding capacity. It is completely automatic and is interlocked with the hydraulic car pusher with one hose. With 150,000 lb of ultimate strength, the machinery features self-lubricating sealed ball bearings, square shafts, no keys or set screws and cast-steel sprockets and brake wheels.

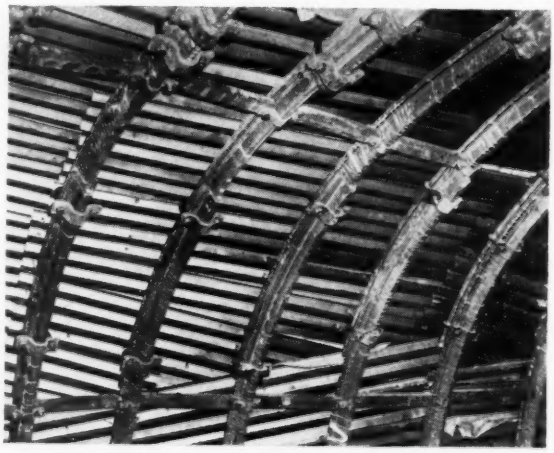


Power Shifting

A new Traxcavator, the 955 Series H, from Caterpillar Tractor Co., Peoria, Ill., features power-shift transmission and is said to give 25% more productivity than prior models on many jobs. The 100-hp machine gets power from a compact turbo-charged 4-cylinder diesel engine. Bucket size has been increased from 1½ to 1¾ cu yd. The new transmission permits single-lever shifting through all phases of the work cycle with a total of four work speeds available to the operator. Other improvements in the machine include six instead of five track rollers, adoption of heavy-duty under-carriage with welded track-guiding guards, and lifetime-lubricated rollers.

Faster Loading

New from Allis-Chalmers Mfg. Corp., Milwaukee 1, is the TL-12, a front-end wheel loader with more speed and capacity. The four-wheel drive machine carries up to 4,000 lb and lifts, while not in motion, up to 9,500 lb. TL-12 has the Tractomatic transmission, with one lever controlling forward and reverse without stopping the machine to clutch and shift gears. There are four forward speeds up to 21.2 mph and four reverse to 27.9 mph, with reverse speeds about 30% faster than forward in the same gear. This design permits faster loading without shifting to a higher gear. TL-12 comes with A-C 77-hp gasoline or 76.5-hp diesel engines. Machine weight is about 11,550 lb. Maximum dumping clearance under the cutting edge is 8 ft 4 in, under the hinge pin, 10 ft 3 in. At maximum dumping height reach from the front of the tires to the cutting edge is 2 ft 8½ in.

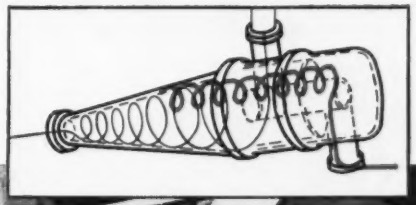


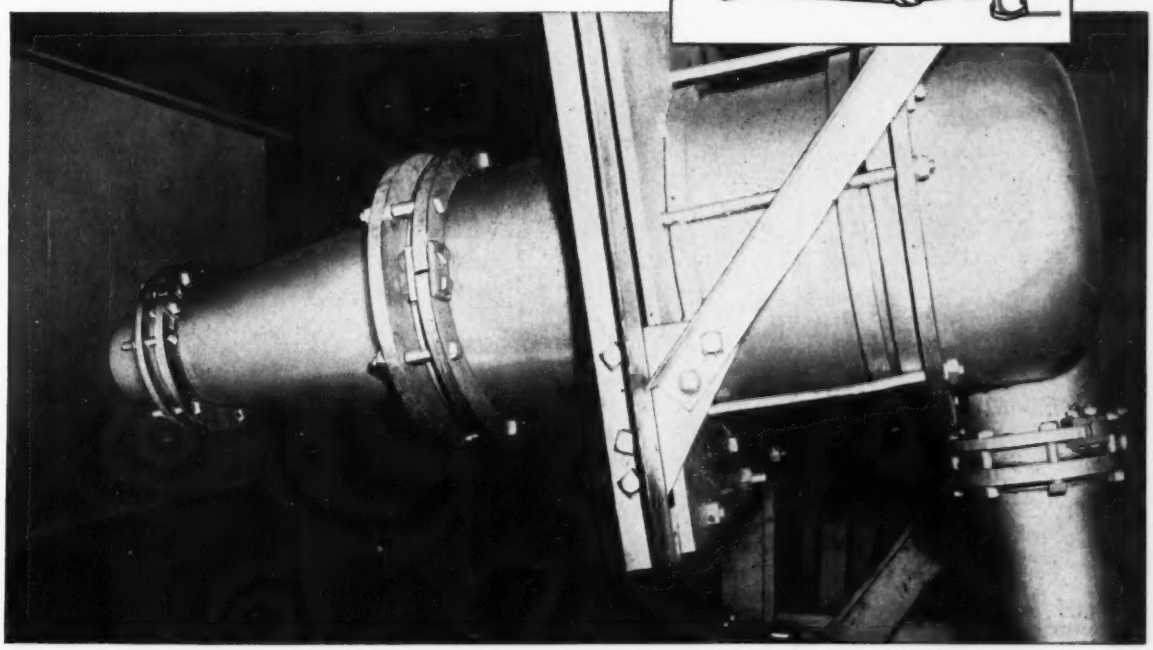
Support Lagging

New, economical and versatile support lagging for use as cribbing in mining and construction has been announced by Commercial Shearing & Stamping Co., Youngstown, Ohio. The lagging has a ribbed surface permitting interlocking when overlapped with the next lagging mat. It is light, easy to handle, fireproof and inexpensive, says the manufacturer. Use of the interlocking lagging means increased strength of the wall system and prevents dangerous gapping; it also eliminates need for anchoring the mat, decreasing installation time, it is noted. The lagging is 11½ in wide and is available in lengths to 9 ft. In the 9-ft length the 14-gage lagging weighs 26.4 lb and the 16-gage, 25 lbs. Area covered per piece is 8.625 sq ft.

(*Continued on p 160*)

NOW IN OPERATION IN THE U.S.A.





The Dutch State Mines
HEAVY MEDIUM CYCLONE WASHER

A new era in fine coal cleaning in the United States has been inaugurated with installations by Roberts & Schaefer of the Dutch State Mines Heavy Medium Cyclone Washing System.

The successful performance of the Heavy Medium Cyclone Washing System during the first few months of operation in this country confirms previous experience of 40 plants in 15 countries.

It cleans fine coal cleaner than any other cleaning system. It substantially increases recovery of fine coal. It enables coal operators to upgrade coal quality to meet premium market requirements.

If you are considering a new fine coal cleaning plant, or rehabilitation of your present facilities, get full information about the Dutch State Mines Heavy Medium Cyclone Washing System. It is available in this country exclusively from Roberts & Schaefer.

In the engineering and construction of Heavy Medium Cyclone Washing Plants in the United States, Roberts & Schaefer has the unique advantage of the collaboration of the Dutch State Mines engineering organization with its technical knowledge and experience with many successfully operating installations around the world.

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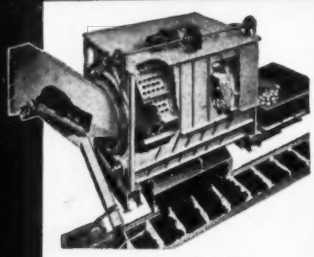
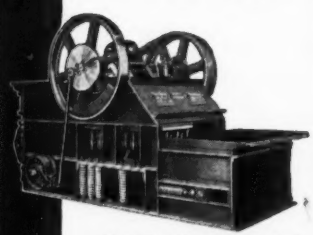
DIVISION OF THOMPSON-STARRETT COMPANY, INC.

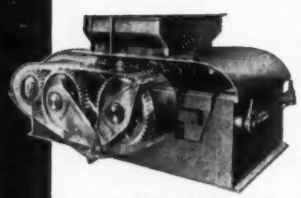
America's most complete line of CRUSHING EQUIPMENT



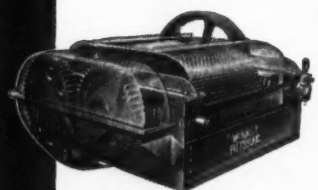
McNally Pittsburg Rotary Breaker
This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



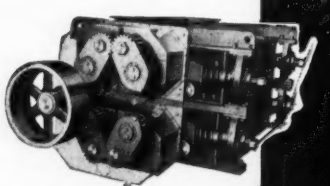
McNally Norton Vertical Pick Breaker
50% Less fines when reducing lump to egg and stove sizes.



McNally Double Roll Gearmatic ROM Breaker
Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.



McNally Gearmatic Stoker Coal Crusher
This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.



McNally Two Stage Crusher
This unit consists of a double roll primary crusher mounted above a double roll secondary crusher—compactly arranged into a single rigid structure.

Available From Stock and on Short Delivery
For immediate action on complete information write, wire, or call

McNALLY PITTSBURG MFG. CORP.
Pittsburg, Kansas Wellston, Ohio

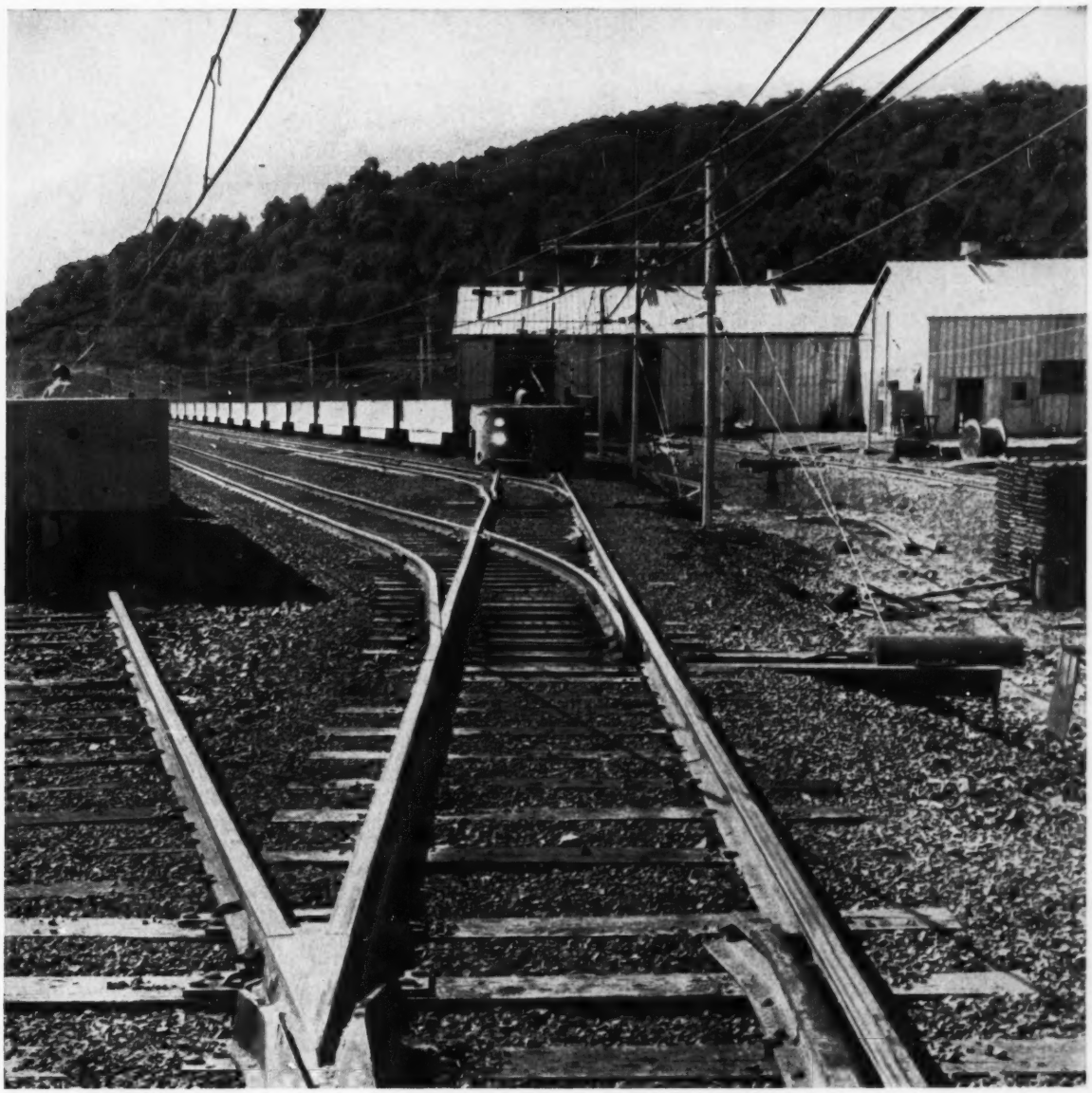
Equipment News (*Continued*)

TRUCK DRILL—Acker Drill Co., Inc., Scranton, Pa., announces its high-capacity core drill, the Presidenté, is available for mounting on a truck. Power for the unit can be furnished by separate self-contained gasoline or diesel engines, or direct-power-take-off from the truck engine. Capacity of the unit is: core drilling to 1,000 ft; auger drilling to 300 ft; and holes up to 24 in in diameter. Features include hydraulic drill head, air brakes and clutch, a new patented automatic chuck and wire drum hoist with cathead.

TEMPLATE CONTROL – Automatic Welding Co., Waukesha, Wis., announces a new automatic-set template positioner attachment on the firm's Track-O-Matic welding unit. The device reduces the operation time up to 80% and results in greater accuracy, according to the firm. Track-O-Matic is a specially-designed welding machine for resurfacing rails on crawler-tractor tracks. With its latest features it can complete a rail of any crawler tractor without remounting or rehandling. Twin welding heads permit rebuilding top surface of both track rails as well as two rail side edges simultaneously. The weld pattern is automatically governed by an electro-set template positioner and photo-electric template scanner, which accurately spaces the metal build-up, shutting off the arc at the track joints.

ROOF BOLT MAT—Commercial Shearing & Stamping Co., Youngstown, Ohio, reports its mine roof-bolt mat for use in mining has been found satisfactory and is ready for market. The new mat is employed for prevention of rock spalling conditions. Providing support between roof bolts, the mats feature strength and cost reduction as a result of overlapping to continue a run or bring a support line out from the center of another mat. Thirteen inches wide and 108 in long, the roof-bolt mat has corrugated edges to provide proper rigidity for ease of installation and substantial support. It is flexible enough to conform to the roughest contours of the mine, says the firm. Two-inch diameter holes are spaced 7 in apart on the mat. Conditions seldom require insertion of more than three bolts, says Commercial Shearing. Between corrugations the mat is 7½ in wide to allow full contact with a roof-bolt plate.

TOUGH WIRE—Greater strength and longer life are features Colorado Fuel & Iron Corp., New York 22, cite for new Double Gray X wire rope. Double Gray, a result of new wire-drawing techniques under investigation by the firm's Wickwire Research Lab., is made from "extra" improved plow steel with independent wire-rope core and is said to have 15% greater breaking strength than improved plow-steel rope. Another important factor in production of the new rope is use of molysulphide in the draw-



Traffic moves on track like this

The owners of this progressive West Virginia mine planned their trackwork with the aid of Bethlehem engineers widely experienced in mine-track design and fabrication.

These turnouts furnish a good example of the kind of results they got (and you can get, too) by handing Bethlehem the job. Notice the big, heavy rail, the smoothly flowing curves, the snugly fitting points. Traffic can keep moving surely and steadily on trackwork like this!

Bethlehem track specialists welcome a challenge of this kind, and they are well-equipped to meet it. They study the situation thoroughly, draw up plans for approval, then turn in the design for fabrication. Before the finished track ever sees a mine, it will have been completely pre-assembled on our layout floors to be sure of perfect fitting.

Best of all, the long-range cost of Bethlehem trackwork comes to a pittance, thanks to operating economies. A Bethlehem mine-track engineeer will be glad to discuss details with you any time you say. You can reach him through the nearest Bethlehem office, or by writing to the address below.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

UNIQUE CONVEYORS DEFY RISING RIVER, GIVE EXTRA WORKING DAYS

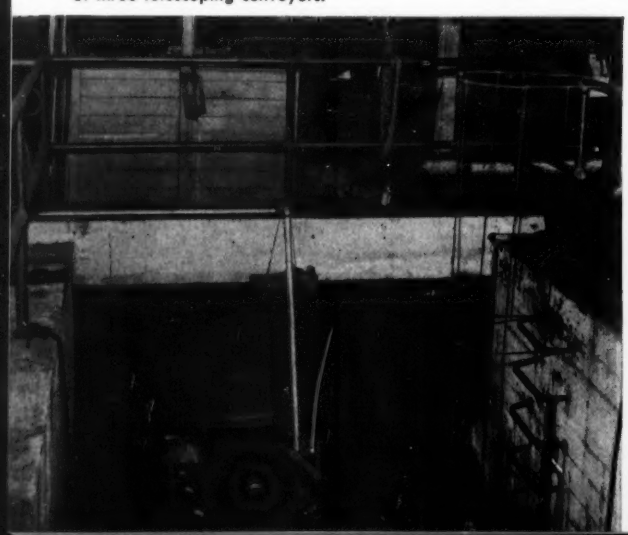
Steel firm's Barber-Greene system loads coal barges at 900 tph when others nearby are shut down by high water

This steel firm's uniquely designed 900 tph coal barge loading conveyor system is the workingest barge loader in the vicinity—being in full operation many days each year when others in the vicinity are inoperative due to high water stages.

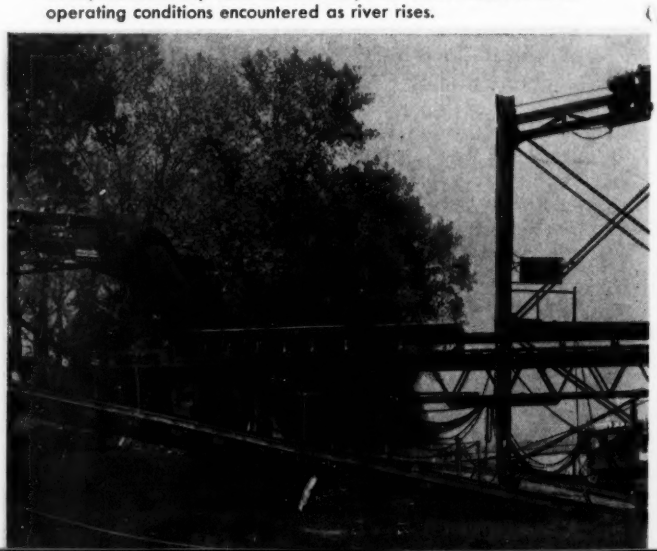
It is the second Barber-Greene installation at this river terminal since 1940, original conveyors being replaced after 17 years only because the company wished to increase capacity by 260%—from 250 to 900 tph. And the first system was credited with saving 87¢ in shipping rates over all-rail haul costs from mine to mill. The old system was never down for more than 15 minutes at any one time over the entire 17 years. Total maintenance was .071¢ per ton for loading 14,000,000 tons of coal.

Barber-Greene design permits this system to keep operating at all river stages—pool to "extreme flood"—a variance of 39.5 feet. As the river rises sharply, production is maintained by hoisting the second conveyor in line of flow out of the way. The last two conveyors in line then move up to fill the gap.

From 70-80 rail cars are emptied in 8 hours at tipple as 55-ft Barber-Greene conveyor moves coal from water-tight pit to series of three telescoping conveyors.



Side view of rail-mounted center conveyor, with structure and hoists, shows how upward and sideways moves are made to meet operating conditions encountered as river rises.



Unique Barber-Greene design permits operation of this coal barge loading system at all river stages.

System components: four standardized heavy-duty conveyors, two 55′ long and two 65′ long. All have 48″ belts.

You can obtain an equally efficient and economical solution to your material handling problems by calling in your Barber-Greene Conveyor Specialist. His Barber-Greene Standardized Conveyors, made up of pre-engineered and pre-aligned components, plus Barber-Greene design experience will solve your material handling problem at lowest per ton cost with unmatched dependability.

Send For New Idler Bulletin

New 44-page Idler Bulletin describes the more than 800 units available in the complete Barber-Greene line, tells how their years-ahead features bring longer life and greater economy to every job. Ask for your copy today.

Your belt conveyor equipment headquarters

Representatives in Principal Cities of the World

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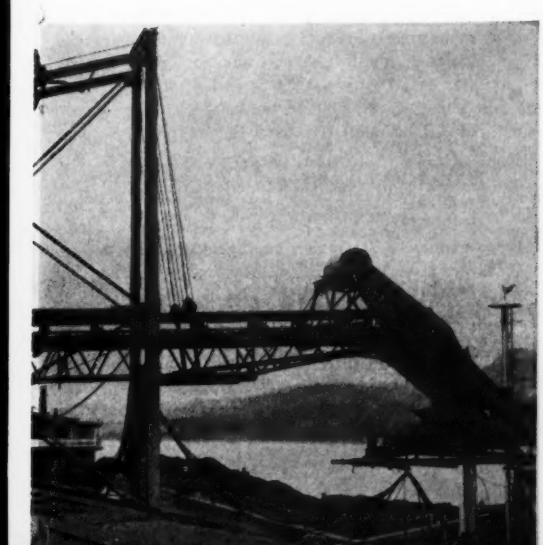
Plants in DeKalb, Illinois..Detroit..Canada..England..Brazil..Australia

CONVEYORS • LOADERS • DITCHERS • ASPHALT PAVING EQUIPMENT

Turn-table mounted conveyor on spar barge has continuous loading hopper-like ramp-mounted conveyors. Swivels parallel to barge to facilitate barge movement. Interlocking controls for all conveyors and feeders are located on barge.



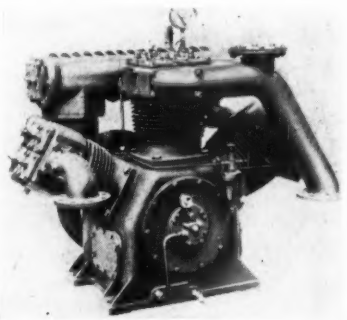
Equipment News (*Continued*)

ing process. This chemical builds a thin permanent molecular shield around each wire, says the firm, helping to separate the wires and cushioning them against effects of bending, crushing and abrasion.

NEW RIPPER—The TD-20 ripper mounts, from Greenville Steel Car Co., Greenville, Pa., are seen on the rear of the Drott K-3 tractor. Shanks and tool beam have sufficient clearance to permit the crawler to tow other equipment. The ripper is equipped with 24-in penetration curved shanks. Pitch and depth controls permit the operator to place and hold points at best ripping depth to the 24-in maximum. The shanks swivel 15 deg in either direction. The tool beam, 102 in wide, is of a reinforced box-type construction equipped with bearing surfaces where swing brackets are attached.

The hydraulic system has a 44-fpm pump which operates from the rear PTO of the crawler.

CRUSHING—An automatic "in-sequence" system for coal crushing where coal goes directly from conveyor belts into a rotary crusher and then to a smaller coal crusher-sampler with an auxiliary sample spout was recently built by Sturtevant Mills Co., Boston, Mass. The system uses a Sturtevant 10-ton-an-hr rotary crusher which grinds the feed to ¼-in size and discharges a 5% sample directly into a Sturtevant coal crusher-sampler. The second sampler regrinds to 8 mesh sizes, returns the bulk of its feed to the belt, and splits the sample twice. It takes the 5% sample of the feed from the large unit and further splits it into the 5, 10 or 15% sample. The result, says the firm, is a homogeneous mixture which is truly cross-representative of the original material. The system is wholly automatic and can be adapted to any material being handled in large quantities. The "in-sequence" crushing, Sturtevant says, with the ultimate triple split of feed, eliminates the problem that has plagued bulk sampling operations—the large sample need to assure a true analysis.



NEW DIESEL—With the new 430-hp V-12 diesel engine as part of its standard line, LeTourneau-Westinghouse Co., Peoria, Ill., notes its Model B Tournapull becomes a big 29-yd companion to the firm's high-performance "V-Power" C. The new engine "has nearly 75 more horsepower than the average of the other machines in its class and the best power-to-weight ratio of any single-engine scraper regardless of size," says L-W's product manager. The 28% increase in horsepower that the new V-Power B has over previous models with standard "in-line" engine increases performance vastly, declares the firm. Acceleration time is reportedly cut by nearly a third as the machine comes out of the cut and gets up to haul speed.

CONVEYOR BELT—Diagonal ridges on its top mark the new "Cleat Top" conveyor belt sold by Hewitt-Robins, Inc., Stamford, Conn. Designed to carry wet sand, gravel, and other materials up steep slopes, the belt can rise as high as 21 deg without slip-back met with smooth-cover belts. When the belt works with the diagonal ridges pointing in the direction of belt travel, moisture in the load is kept uniform throughout the length of the belt. If the belt is run with the open ends of the diagonal ridge trailing the direction of travel, the water is drained off during movement. The belt can be gotten in widths from 12 to 30 in. Wider sizes will be available in the near future.

GAS TORCH—A natural-gas cutting torch that can slice through 30 in of metal in one pass has been put out by Linde Co., Div. of Union Carbide Corp., New York 17. The new Oxweld C-66 has the largest gas flow-up to 3,000 cfh of oxygen and 250 cfh of natural gas—and the widest cutting range of any existing natural-gas hand cutting torch, declares the manufacturer. It will handle every manual cutting job in factories and shops and is ideal for removing large risers, according to Linde. Special applications such as gouging, rivet piercing and pad and fin washing can also be handled. A spring-loaded injector assembly provided uniform and thorough mixing of gases and eliminates flashback.

HAND PUMP—A new compact "midget" hydraulic hand pump that will develop a full 8,650 psi is announced by Owatonna Tool Co., Owatonna, Minn. The pump is 14 5/16 in long and has an oil capacity of 13.5 cu in. Piston area is .100 sq in, diameter ⅜ in and stroke 9/16 in, displacing .0261 cu in. The pump is said to provide fast and efficient operation for the new OTC 2- and 4-ton capacity single-cylinder rams which were recently added to the OTC line.

CORE BARRELS—Series 10 Wire Line core barrels, from E. J. Longyear Co., 76 S. 8th St., Minneapolis 20, Minn., recover cores up to 25% larger in diameter than the original Wire Line barrels, according to the firm. The new series barrels increase core size to 15/16, 1 5/16 and 1 23/32 in for AX, BX, and NX barrels, but drill the same holes as the old AX, BX and NX designs. Narrower kerfs of bits used with the new barrels reduce

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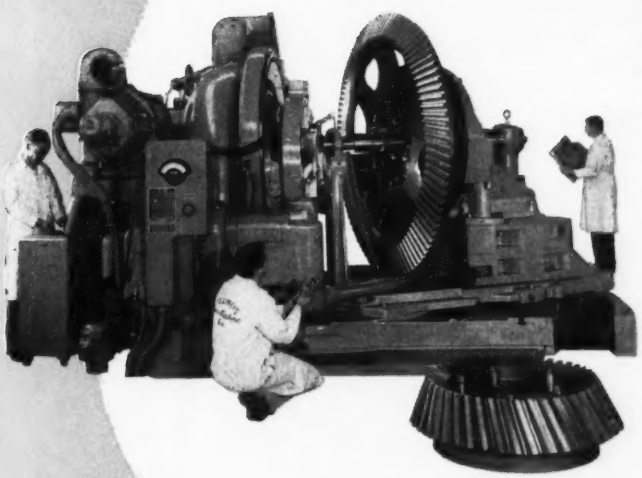

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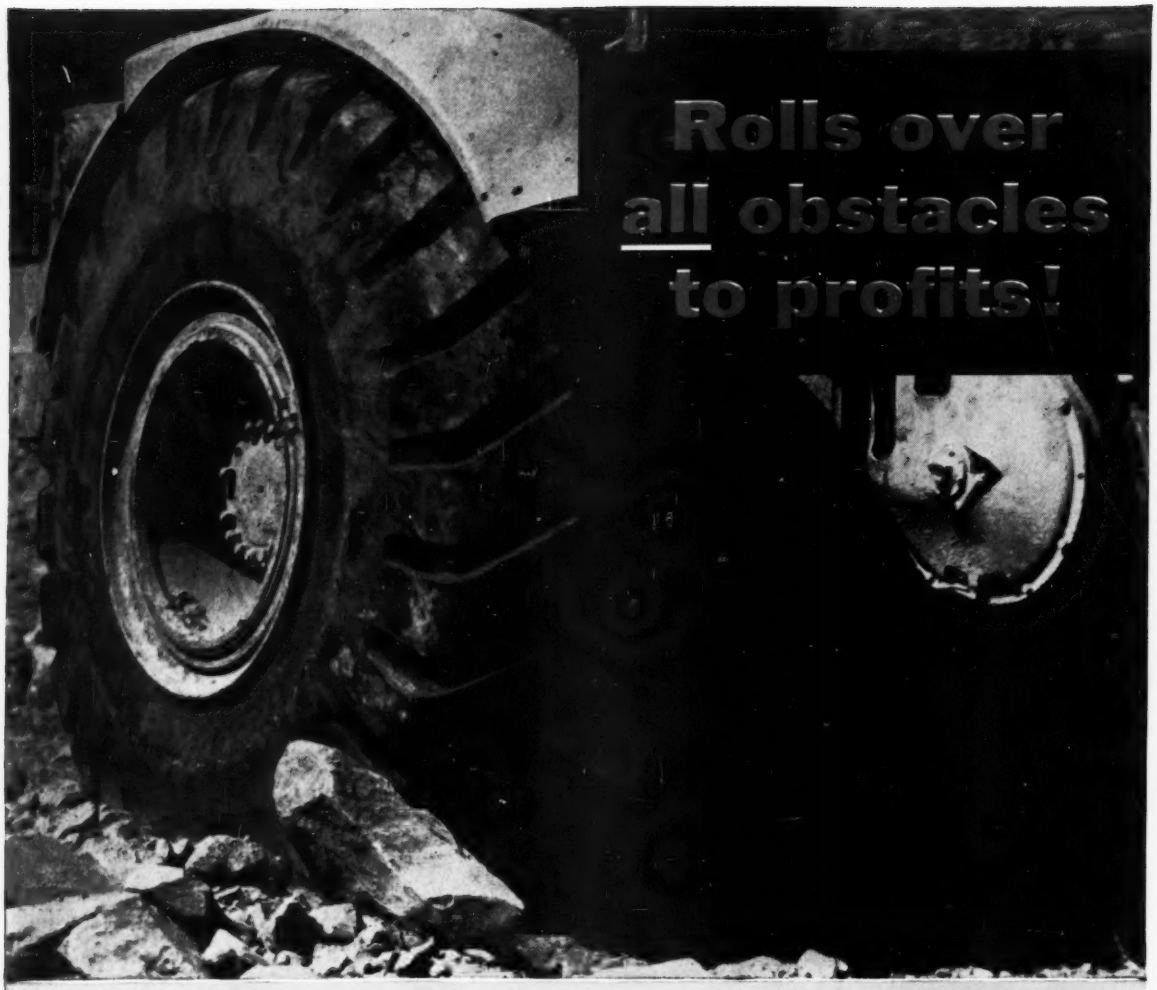


NYGEN-BUILT

GENERAL TIRES

reduce downtime losses to build up more profit for you!

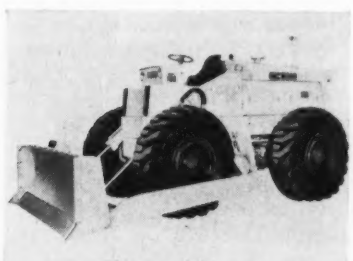
Projects that rip ordinary tires and schedules to shreds are naturals for extra rugged General Off-the-Road Tires. With stronger-than-steel Nygen cord construction and a deep-digging, high-flotation tread, Generals are built to take on rock, stumps, mud, sand without let-up or let-down. And that means more work done...more profit counted every day of the job! Be sure of both on your next project with General Off-the-Road Tires.

THE GENERAL TIRE & RUBBER CO. • AKRON 9, OHIO

the carat weights of diamonds by 10 to 20% compared with previous wider kerfs, and also help to increase penetration speed and bit life.

LIGHT CONDUIT—A line of aluminum electrical conduit, most suited to installations needing light weight, corrosion-resistance and easy bending, is now put out by H. K. Porter Co., Inc., National Electric Div., Pittsburgh, Pa. Full grounding of NE-aluminum conduit is achieved in extended runs by precisely-formed threads engaging couplings smoothly and tightly for a solid connection. The conduit comes in all sizes, ranging from ½ to 6 in in diameter. Each length measures 10 ft when a coupling is attached. Color-coded thread protectors are used for ease of stocking and size selection.

COMPRESSORS—Introduction of a new series of all-purpose air compressors delivering from 174 to 338 cfm has been announced by Atlas Copco, New York 17. The new machines are two-stage single-acting units featuring air-cooled cylinders and cylinder heads. This design, says the firm, facilitates flow of lubricating oils and eliminates condensation. Equipped with water-cooled inter-coolers, the machines are rated for working pressures up to 125 psi. High-grade alloy steels are used in valve seats and guards to assure extended machine life.



IMPROVED DOZER—The Construction Machinery Div. of Clark Equipment Co., Benton Harbor, Mich., has announced changes in the Michigan Model 180 tractor-dozer, aimed at increasing machine productivity. The diesel-powered, 162-hp unit, smallest in the Michigan line of

WEDGE-WIRE

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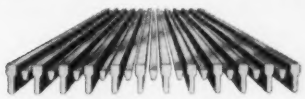
Kleenslot

PREPARATION SCREENS

designed for vibrators or stationary applications —for dewatering, screening, washing, extracting, filtering or sizing

T-WEDGE KLEENSLOT



A new concept in guard bar design. T-shaped wire replaces typical "bar" to increase screening surface while keeping large unscreenable lumps of material above the tolerance governing lower screening surface.

F217 and F250 KLEENSLOT

Large size wires maintain maximum efficiency over an extended period in abrasive applications.

Although large in wire size, this screen will maintain openings as close as 1 m.m.

"S" KLEENSLOT

For applications where screening out of flats or slivers is of prime consideration. Also furnished in a "C" bend. Recommended for applications requiring openings larger than 1 m.m.

MARCEL

This screen, while screening out "slivers," presents a flat surface for materials to wipe the opening clean Available with openings up to 1 m.m.—for larger opening see "S" screens.

SCREEN GUARD

Vertical guard bars keep larger unscreenable materials above the actual screening surface. This increases screen life and promotes much greater efficiency in dewatering.

G187 and GB187 MIGH-TEE KLEENSLOT

Special profile increases wearing surface. This is a heavy duty precision type screen that will easily maintain openings smaller than ⅛ m.m. and openings larger than ordinarily considered economical.

TAPER-SLOT
From loop to loop, the screen opening gradually increases. This design is to eliminate blinding when screening large amounts of near-opening size materials.
For example: .016 opening tapered to .024—the combination of opening sizes would be the same between each loop throughout the entire screen.
Wedge-Wire Kleenslot screens are custom manufactured to your application and are available in many sizes, metals and finishes. Our engineering staff will assist you capably and promptly in obtaining the proper screen for highest production at lowest cost.
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SCREENS FOR INDUSTRY

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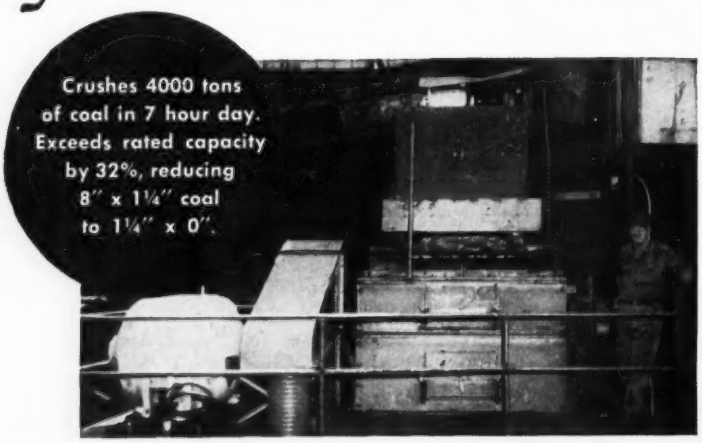
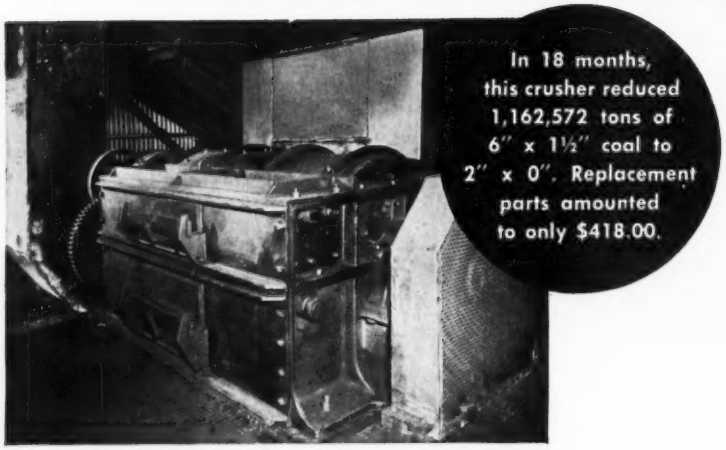
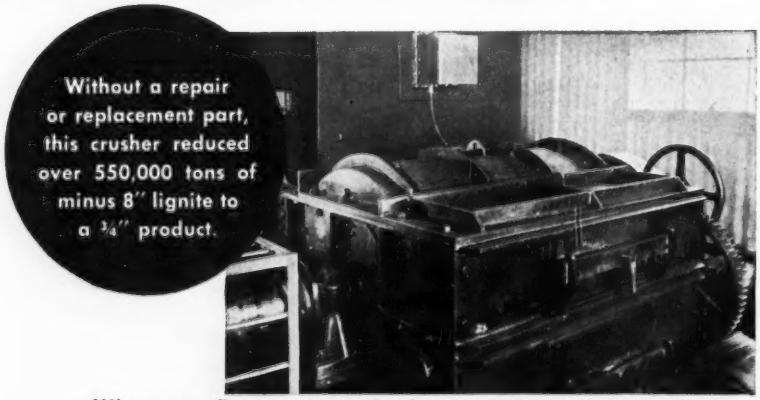
on *American* COAL CRUSHERS







When you figure costs, the best results come from American Rolling Ring Crushers

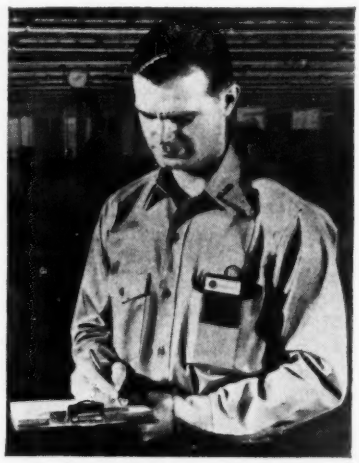
American PULVERIZER COMPANY

ORIGINATORS AND MANUFACTURERS OF RING CRUSHERS AND PULVERIZERS

1119 MACKLIND AVE. ST. LOUIS 10, MISSOURI

Equipment News (*Continued*)

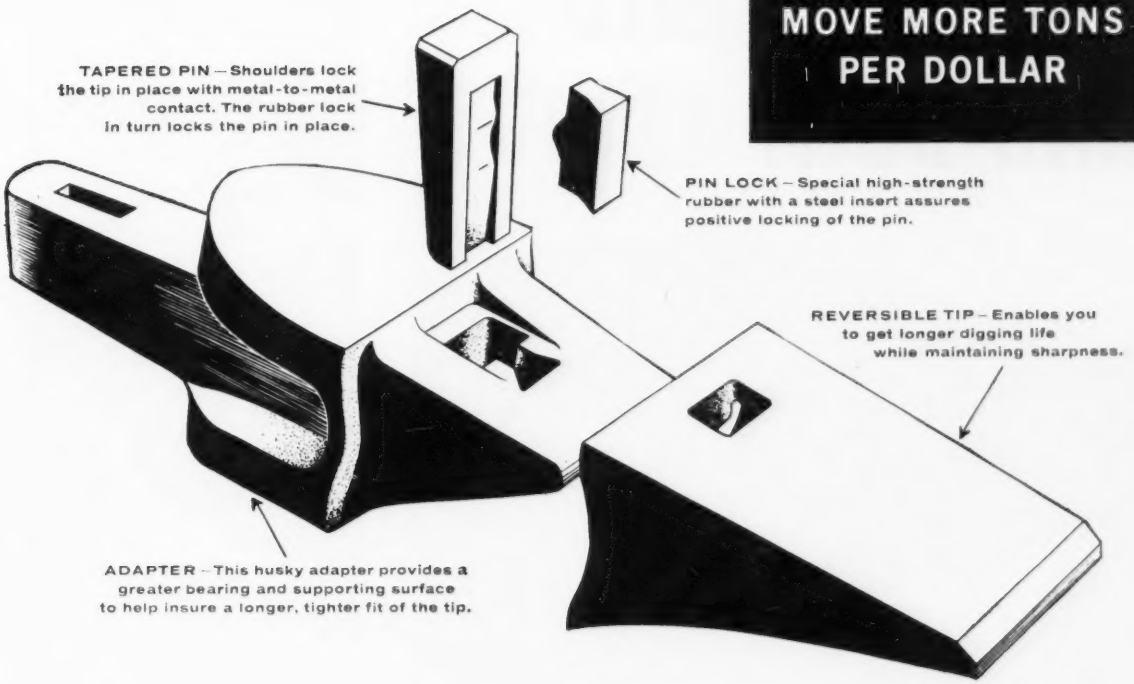
rubber-tired tractor-dozers, now has all features standard on the larger units of this type, including Michigan "power train." The machine has a new blade with a built-in push-plate that permits the 180 to be used as a dozer or pusher without exchanging dozer blade for push-block. Maximum digging depth of the cutting edge is 2 ft 3 in, an increases of 4 in. Push arms have been lengthened 12 in to increase blade control. Wheelbase has been lengthened 12 in for more stability and two double-acting hydraulic cylinders are now used to steer the machine in place of the single cylinder previously used.

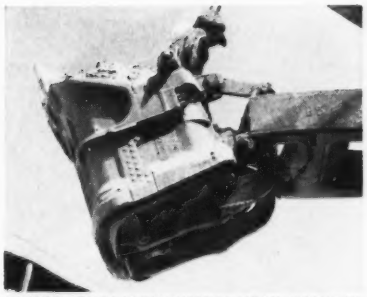


POCKET RADIO—General Electric Co., Communications Dept., Lynchburg, Va., has introduced a new all-transistorized shirt-pocket radio communications receiver with minaturized circuitry that boosts audio efficiency and requires 35% less battery power than previous hand-carried message equipment of its type. The new unit, "Voice Director," weighs only 12 oz with battery. For indoor and outdoor voice paging to reach key personnel, the new equipment is engineered so the person wearing it may be contacted instantly by a base-station transmitter, a two-way radio in a car or by a portable unit operating on the same frequency. A ferrite loop-stick for an antenna eliminates the need for an externally-mounted antenna, and the device is said by G-E to have receiver selectivity and sensitivity comparable to mobile radios many times heavier and larger.

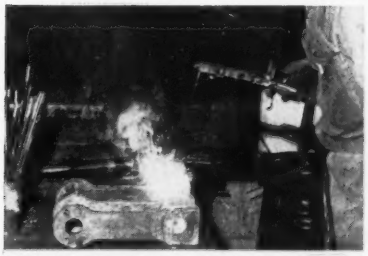
DUST COLLECTOR—An efficient low-cost cylindrical fabric dust collector that reclaims materials in dry state, has been announced by American Air Filter Co., Inc., Louisville 8, Ky. The unit can be shipped in small sections and assembled at the installation site. The Model B AMERjet reverse-jet collector has advanced features, says the firm. Operation

AMSCO HELPS YOU MOVE MORE TONS PER DOLLAR


TAPERED PIN — Shoulders lock the tip in place with metal-to-metal contact. The rubber lock in turn locks the pin in place.
PIN LOCK — Special high-strength rubber with a steel insert assures positive locking of the pin.
REVERSIBLE TIP — Enables you to get longer digging life while maintaining sharpness.
ADAPTER — This husky adapter provides a greater bearing and supporting surface to help insure a longer, tighter fit of the tip.



AMSCO CAST MANGANESE STEEL DIPPERS *Installed as original equipment on many leading makes of power shovels. Cast of manganese steel—"the toughest steel known"—a material which provides as much as a ten-to-one advantage in lasting power over other steels, under the abuse of severe impact and abrasion. Sizes from ¾ cu. yd. to 9 cu. yd. capacity.*



AMSCO HARDFACING FOR BUILD-UP AND REPAIR—*Add extra service life at low cost to dippers, dipper teeth, hammers, augers, etc. . . . with Amsco Hardfacing. Complete line of hardfacing electrodes available through your Amsco welding distributor. Or write us for condensed catalog and price list on "Amsco Hardfacing Alloys".*

AMSCO SIMPLEX 2-Part Dipper Tooth extends digging life stays sharp • easy to replace*

Now you can save hours of costly shovel downtime . . . by using this new Amsco Simplex 2-Part Tooth. Simplex tips are quickly reversible to give added tip life while retaining sharpness. And when teeth eventually become worn, just knock out the retaining pin and replace with a new tip.

Simplex adapters fit this new 2-part tooth to *any* Amsco dipper or backhoe. And because Amsco makes both dippers and dipper teeth, you can be sure of proper fit between the adapter and shovel lips.

Cast of a new alloy especially developed for this service, the Amsco Simplex design is backed by over 50 years of experience in producing dippers and dipper teeth for the most rugged digging conditions.

Ask your power shovel distributor to supply you with these extra-long-wearing Simplex 2-part teeth . . . now!

WRITE US for complete descriptive bulletin on Amsco Simplex teeth, giving information on sizes and types available.

*Patent No. 2,504,908

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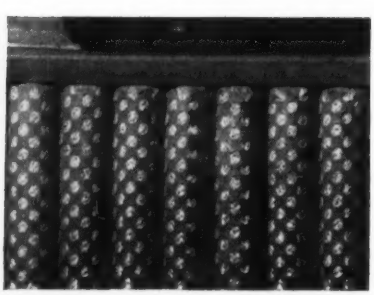
In Canada: Joliette Steel and Manitoba Steel Foundry Divisions

Welding products distributed by Canadian Liquid Air Co., Ltd.

THIS BATTERY LETS YOU HAUL MORE TONS PER DOLLAR...
AND DO IT LONGER

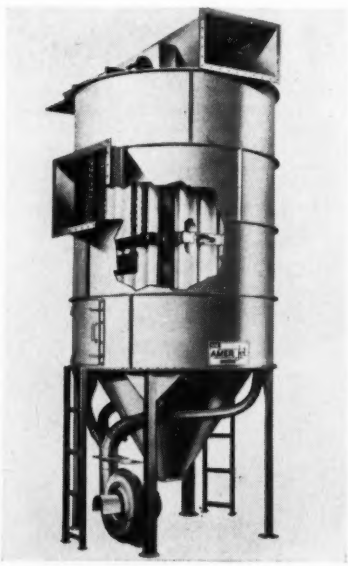
New improved Exide-Ironclad Batteries give you up to 45% more power than the same size battery you may be using now—and longer life as well. Positive plate active material is made more useful by higher porosity tubing—with a corresponding increase in battery capacity and cost economy. As a result, your equipment can pull more tons of load per dollar of battery investment. Exide-Ironclad tubular construction protects the active material from battery-killing vibration and jarring—you get years' longer service life without failure.

The largest work output for the longest time—not purchase price—is the key to true battery economy. So when you need batteries, specify Exide-Ironclad and get the most production capacity your dollars can buy. For details, write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 20, Pa.



Here's Why—The improved Exide-Ironclad tubular positive plate packs more active material for greater capacity. The armored porous tubing holds the material securely for long battery life, yet permits free access of electrolyte for high power under sustained load.

Exide®



is simple. Dust-laden air is drawn or blown into the inlet plenum at the top of the unit. The dust enters the filter bags through venturi-shaped inlets. Most of the dust precipitates to the conical hopper at the lower end of each filter bag. The fine dust is held by the velocity of the air against the inside of the 9-in diameter filter bag. Dislodging of the fines from the bag is accomplished by a reverse-jet of air through heavy-duty continous die-cast aluminum jet rings which form a complete jet case assembly, matching the number of bags selected.

HANGER STRAP – Plain, galvanized or copper-coated finishes are offered in a new line of Perforated hanger strap, being sold by Holup Industries, Inc., Sycamore, Ill. According to the firm, the strap sometimes called "Hanger Iron," is made of a special-gage coiled steel of uniform quality and thickness. It is easy to lend or twist to the desired shape

and holds 500 lb safely. All three types of "Hi" hanger strap are available in 10-ft coils, bulk. The strap is ¾-in wide and perforated with ¼-in holes on ½-in centers. Edges are smooth to prevent finger cuts.

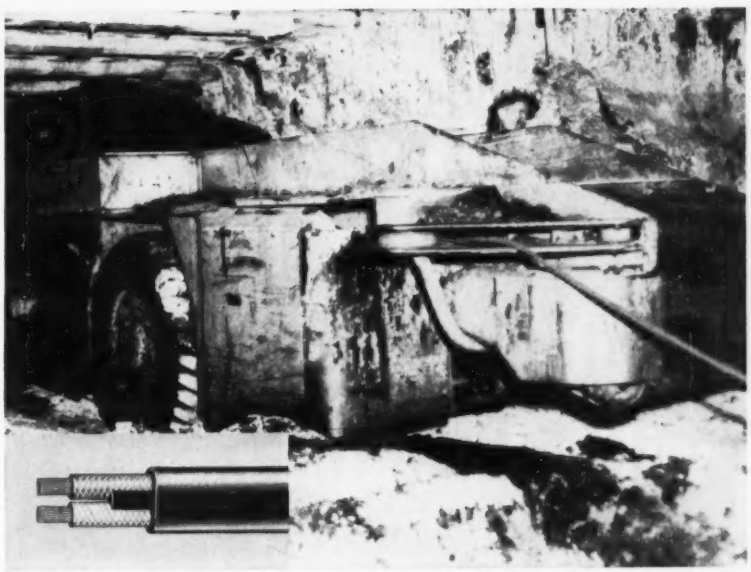
NEW SHAKER—One man can safely operate a new car shaker made by Syntron Co., Homer City, Pa. The shaker mounts anywhere along the car's length by means of a jib crane or fork lift. There are no chains or rods to tighten, no need for the operator to get in, on, or under the car. The rotary vibrator is in a steel frame which hooks over light or heavy flanged car sides. It transmits powerful vibrations throughout the car, loosening and shaking compacted material through open hopper gates, says Syntron. The device gives 900 vibrations per min, operating from 220 or 440 V, three-phase, 60 cycle, AC.

COMPRESSOR—A complete 600-cfm rotary portable compressor unit for rear-mounting on tractors has been introduced by Joy Mfg. Co., Pittsburgh 22. Airvane RT-600 mounts easily on a tractor and is driven through a rear power-take-off Joy says it is the most economical method of converting a used tractor into a highly mobile compressed-air producer.

BOLTLESS COUNTERS—Alan Wood Steel Co.'s Penco Div., 200 Brower Ave., Oaks, Pa., is marketing a boltless counter with applications in warehouses, factory storerooms parts departments and similar-type facilities. Known as T-line counters, they feature ease of assembly, durability and long color-life.

NEW ANTI-FREEZE—"Telar" antifreeze, product of E. I. du Pont De Nemours & Co., Inc., Wilmington 98, Del., can be used safely year after year without draining, states the firm. The product prevents rust and also cools effectively summer and winter, according

Mining Machine Cable Must Be Rugged... NATIONAL ELECTRIC INDESTRUCTO IS!



Exceptionally rugged National Electric Indestructo Mining Machine Cable meets the severest service demands under all operating conditions. Service records in hundreds of mines prove it. The cable assembly, conductor and ground wire, is molded in a heavy neoprene sheath to provide the strength necessary for mining operation.

Indestructo is furnished with or without a grounding conductor. The grounding conductor construction assures positive grounding of rubber-tired motorized equipment.

Indestructo comes in a complete selection of sizes for every mining machine application in underground or strip mines.

For additional information write to: *National Electric Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

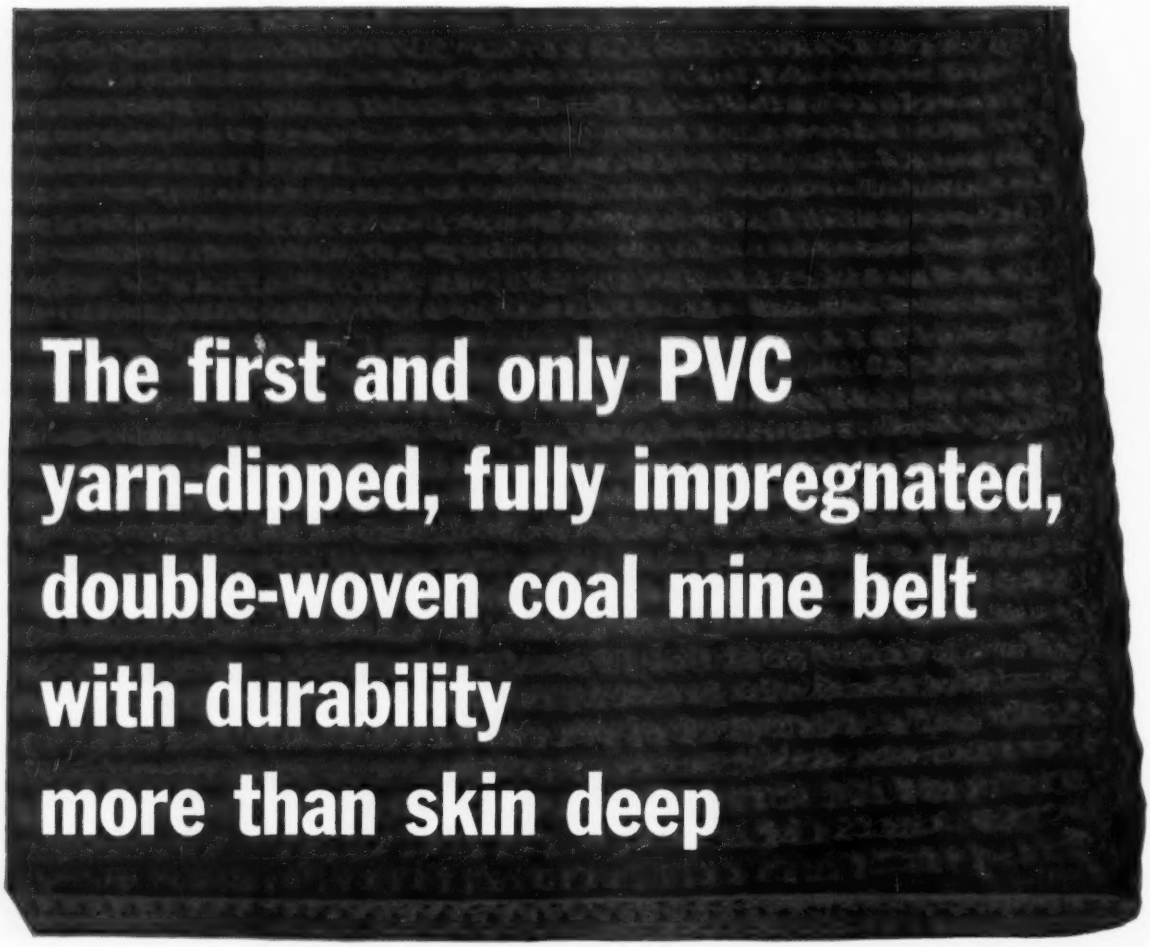
NATIONAL ELECTRIC DIVISION

PORTER

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

Quaker Thermoid **introduces revolutionary "Plasticoal"**



The first and only PVC yarn-dipped, fully impregnated, double-woven coal mine belt with durability more than skin deep

All the disadvantages of short life, slippage, stretching and rotting of conventional light-weight coal mine belts have been overcome by the revolutionary Thermoid-Quaker "Plasticoal" belt.

In contrast to conventional double-woven cotton fabric covered with neoprene, new "Plasticoal" is impregnated through and through with Polyvinyl Chloride . . . even the yarn is PVC dipped before it is woven. Nylon cords are added, in both directions, to provide extra strength and the entire impregnated carcass is heat-set under tension before the final dip and heat-set.

For underground mine safety, USBM 28-11 "Plasticoal" is flame retardant and flame resistant. It's lighter in weight and more flexible for ease of handling underground. The rough surfaces give better material traction, less slippage, yet require less tension. And being completely impregnated with PVC, the "Plasticoal" carcass carries the load long after the cover is worn away. Even extreme edge wear will not put "Plasticoal" out of commission.

Mine-orange "Plasticoal" is available from stock in 26", 30" and 36" widths, up to 600' lengths or longer on request. See your Thermoid Division Distributor for all the advantages of new "Plasticoal." Or write *Thermoid Division, H. K. Porter Company, Inc., 200 Whitehead Road, Trenton 6, New Jersey.*

THERMOID DIVISION PORTER **H.K. PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

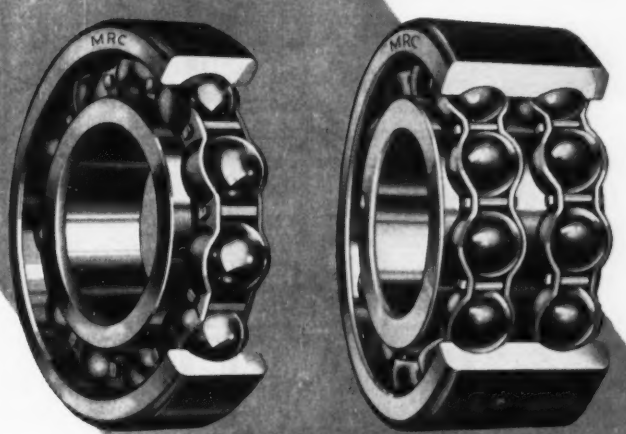
MARLIN-ROCKWELL

RELIABILITY

COUNTS

"SUPER-MAX" Ball Bearings

carry ALL the load... ALL the Way



providing efficient operation and long life
in heavy-duty mining equipment.

Backed by 62 Years Experience

Consult OUR Engineering Department on YOUR Bearing Problems

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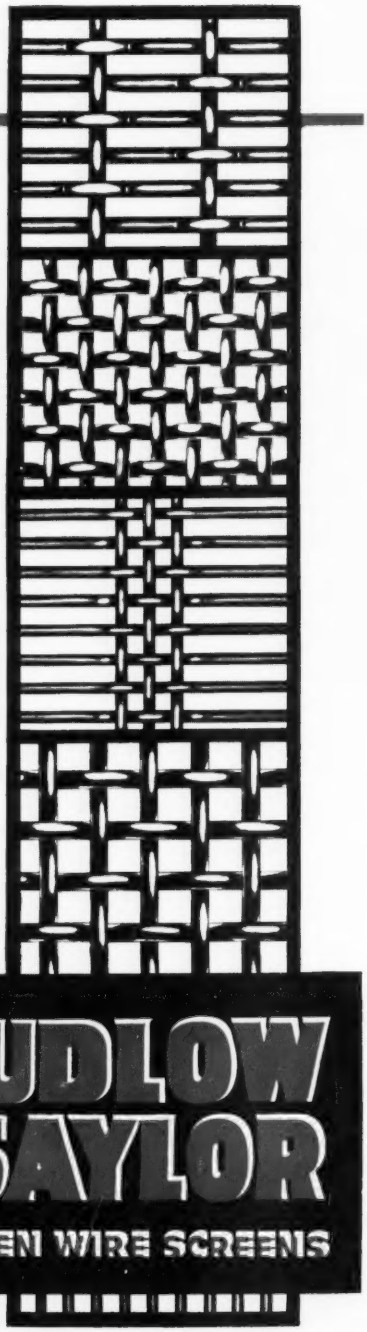
BALL AND ROLLER
bearings

Fights abrasion, fatigue, distortion



The hardest, toughest wire metallurgical science can produce—woven to exceed the industry's top standards for precision and rigidity—levelled and sheared on special machines to absolute flatness and accuracy—then finished with hook strips or edge hooks as straight as a die.

Small wonder that L-S Screens can be installed under greater tension, will stand up far longer against wear and breakage. Result: Fewer screen replacements, higher output, more uniform product quality.

Bonus! L-S Screens cost no more than ordinary screens. Insist on L-S Screens when you order. Write for Condensed Screen Reference Catalog.

IMMEDIATE SHIPMENT
most weaves and sizes

Ludlow-Saylor Screens and Wire Cloth can be furnished in any steel including SUPERLOY high carbon, LUDLOY oil-tempered, stainless or other alloys; Monel, bronze, copper, brass or any metal that can be drawn into wire.

LUDLOW-SAYLOR
WOVEN WIRE SCREENS

LUDLOW-SAYLOR WIRE CLOTH CO. • 609 S. NEWSTEAD AVE. • ST. LOUIS 10, MO.

LOS ANGELES Star Wire Screen & Iron Works, Inc. (L-S Subsidiary), 2515 San Fernando Rd.
BIRMINGHAM 512 N. 18th St. **CHICAGO** 6261 West Grand Ave. **DENVER** 1530 Carr St.
HOUSTON 5638 Harvey Wilson Dr. **PITTSBURGH** Union Trust Bldg.

FOUNDED 1856

Equipment News *(Continued)*

to du Pont. "Telar" can be mixed with water so no specially prepared mixture must be sought to make up for normal losses. One unique feature of the product is a built-in signal that warns of major cooling-system breakdowns before costly damage takes place. Called "Color Check," this feature changes the normal red color of the liquid to yellow if a leaky water pump, hose connection or cylinder-head gasket lets too much air or corrosive exhaust gases into the anti-freeze solution, contaminating the coolant.

Free Bulletins

Visibility—E. I. du Pont De Nemours & Co., Wilmington, Del. Folder on high-visibility Pyralux fluorescent enamel for safety and decorative painting of vehicles, aircraft, and signs is available.

Rubber Hose—Mercer Rubber Co., Hamilton Square, N. J. Complete line of rubber hose for general industrial application is discussed in new 24-p catalog.

Pumps—Rice Pump & Machine Co., Belgium, Wis.—Bulletin CPE-1-27 covers new Rice self-priming industrial pumps from 1½ to 10 in high head and high capacity.

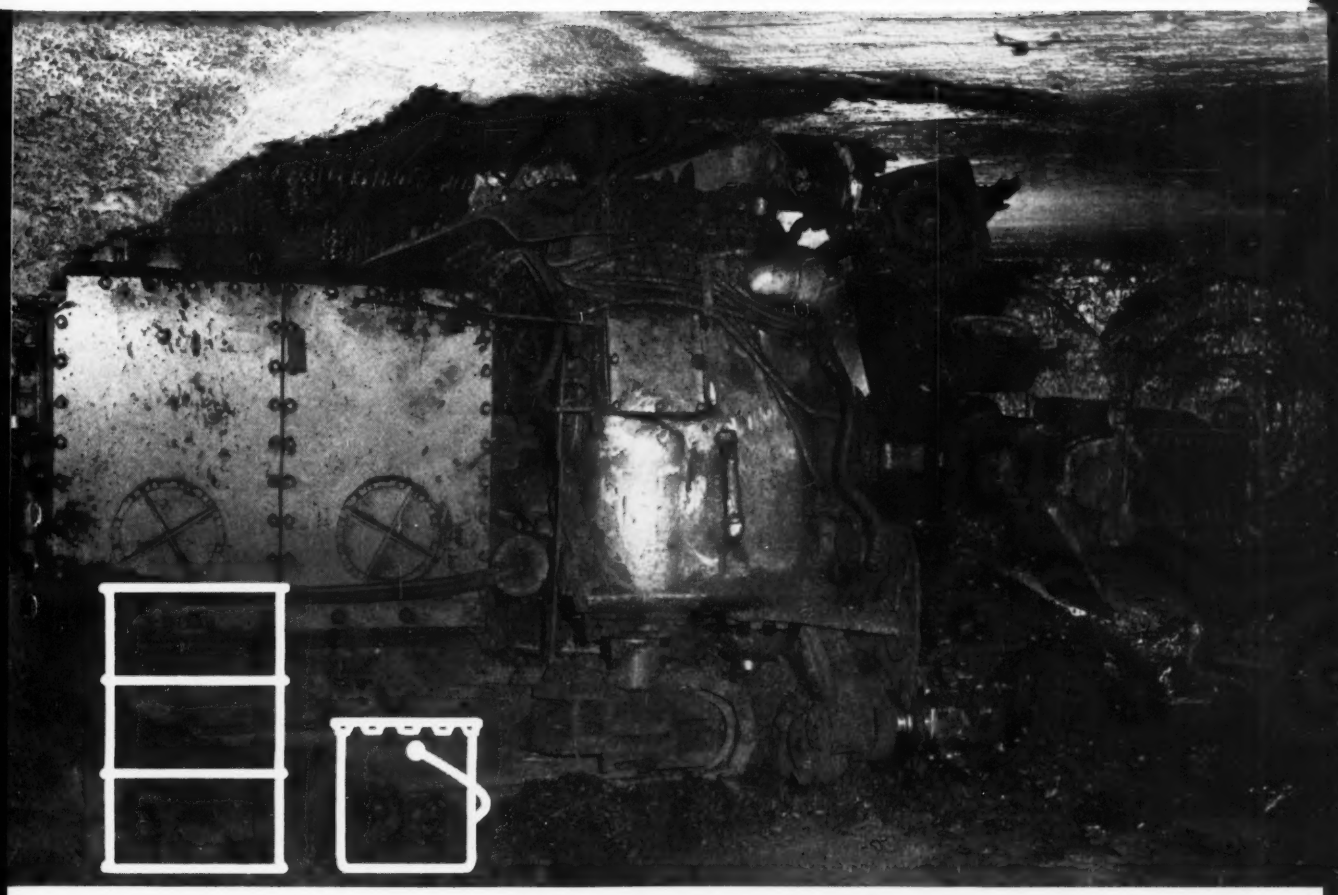
Crusher—McLanahan & Stone Corp., Hollidaysburg, Pa. Booklet discussed two-stage Triple Roll crusher, which reduces run-of-mine coal or direct open-pit feed to sizes as small as ½ in in a single pass.

Transmissions—Dodge Mfg. Corp., Mishawaka, Ind. Book, 468 pp, describes all products in firm's growing line of mechanical power-transmission equipment.

Shovel—The Thew Shovel Co., Lorain, Ohio. New 12-p bulletin covers company's 47-ton Model 820A, which may be used as 2-yd shovel, or as crane, dragline, clamshell or hoe.

Motors—Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 33. Bulletin MU-244 describes doubly-protected dripproof and totally-enclosed polyphase squirrel-cage motors, 1 hp and larger, with NEMA "C" faceplates for close-coupled centrifugal-pump applications.

Electrodes—Arcair Co., P. O. Box 431, Lancaster, Ohio. Literature describes special electrodes used with Arcair process. Lists different types of electrodes available for use with Arcair torches.



NOW! just two lubes underground!

FOR ALL MAJOR LUBRICATION

One oil, one grease is all you need for all major mine lubrication with Texaco's new Simplified Lubrication Plan. The only exception is that motor armatures require a second grease, but the amount is insignificant in terms of total lubricant requirements.

HERE ARE THE BENEFITS TO YOU!

Less money tied up in inventory. You only have to stock two principal lubricants.

Less danger of misapplication. Your men can avoid mistakes with only one oil and one grease for major lubrication jobs.

Fewer purchase orders to write. Your purchasing expenses can drop significantly when you have fewer lubes to order.

Saves on handling costs. You need bring fewer lubricants up to working face.

TALK TO YOUR TEXACO LUBRICATION ENGINEER

He can give you the details of Texaco's new money-saving Simplified Lubrication Plan. Just call the nearest of the more than 2,300 Texaco Distributing Plants or write:

Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

TEXACO

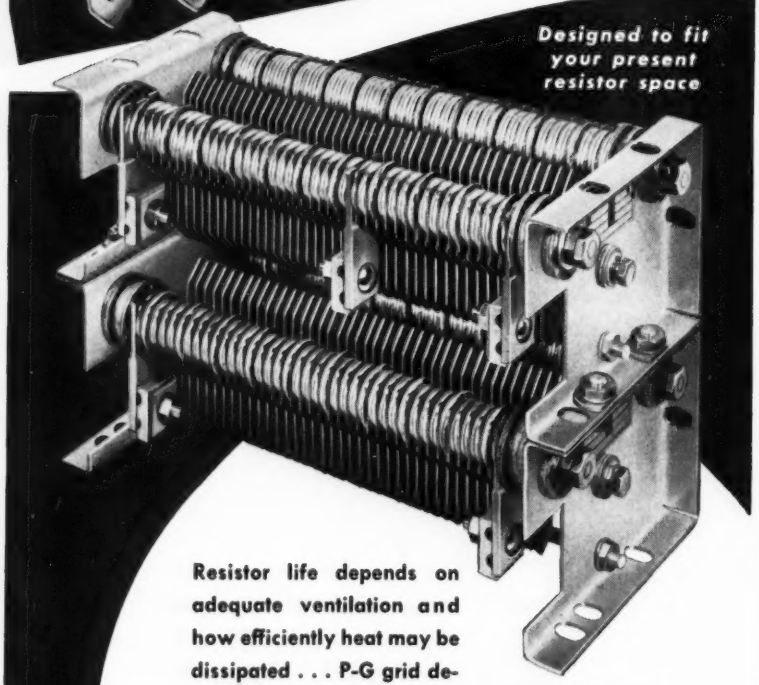
Throughout the United States

Canada • Latin America • West Africa

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

Resistor life depends on adequate ventilation...

Patented P-G Grid Design assures maximum ventilation



Designed to fit your present resistor space

Resistor life depends on adequate ventilation and how efficiently heat may be dissipated . . . P-G grid design equalizes the amount of air space surrounding each leg or loop to obtain even heat throughout the grid area. (Note illustration.) . . . Since heat is rapidly and evenly dissipated, hot spots fail to develop and longer resistor life is assured . . . For a nonbreakable resistor (only steel and mica used) specify P-G on your next application.

P-G

The Nonbreakable Steel Grid Resistor

THE **POST-GLOVER** ELECTRIC COMPANY

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

Equipment News *(Continued)*

Hose—The Weatherhead Co., 128 W. Washington Blvd., Fort Wayne, Ind. Wall or desk chart designed to simplify selection of hose and hose ends is available from firm. Covers complete range of bulk hose types. Form No. 6175, with data on standard steel and brass fittings, also available.

Relay Testing—Multi-Amp Div., Multi-Amp Electronics Corp., 465 Lehigh Ave., Union, N. J. Standardization of test and test equipment for relay testing is subject of Bulletin SB-RT-1.

Safety Box—Mine Safety Appliances Co., Pittsburgh 19. New M-S-A flip-top box for multiple-use first-aid units is described in Bulletin No. 0401-8.

Chains, Sprockets—Link-Belt Co., Chicago 1. Stock sizes of Link-Belt roller chains and sprockets available for immediate delivery are listed in new 44-p book, No. 2757.

Screens — Cross-Perforated Metals Plant, National-Standard Co., Carbondale, Pa. Applications and specifications for Condure pierced-metal and Rima slit screen, recently introduced in United States are described in new 12-p Bulletin C101.

Aluminum Wheels—Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19. "Weigh the facts" is a booklet telling about aluminum wheel advantages.

Crawler—Euclid Div., General Motors Corp., Cleveland 17. A 24-p report on Model C-6 tractors tells of advantages of this 211-hp machine.

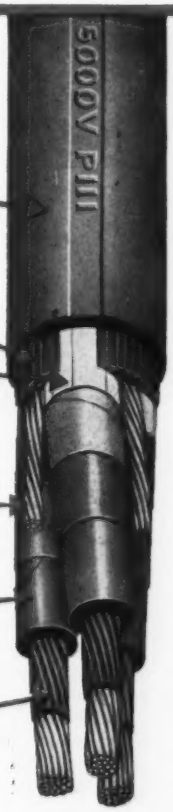
Clamshells, Buckets—Wellman Engineering Co., 113 St. Clair Ave., Cleveland 14. A 32-p catalog covers all types and sizes of Williams clamshell and dragline buckets.

Couplings—Twin Disc Clutch Co., Racine, Wis. Complete line of Twin Disc fluid couplings is covered in Bulletin 144-E. Horsepower range is ¾ to 850.

Substations — McGraw-Edison Co., Pennsylvania Transformer Div., Canonsburg, Pa. Workbook to aid on planning articulate unit substations for secondary distribution, with ratings, weights and dimensions, is available from firm.

Shovel Line—Clark Equipment Co., Construction Machinery Div., Benton Harbor, Mich. New 4-color bulletin describing power, speed and handling of six "Michigan" line tractor shovels is put out by firm.

YOU CAN SEE WHAT MAKES ROEBLING MINE POWER FEEDER CABLE YOUR BEST BUY!



Tough, long-wear Roeprene® sheath wards off moisture, retards flame, resists oil, corrosion, abrasion. Meets flame-resistance requirements of Pennsylvania Dept. of Mines and carries symbol P-111.

All-rubber fillers for moisture resistance, splicing ease.

Tinned-copper shield tape for added safety of operation.

Adequate ground wires, in contact with conductor shielding. Grounds equal more than 90% of circular mil area of single power conductor, for complete grounding and fault return.

Butyl insulation for heat-, moisture-, ozone-resistance. Rated at 90° C copper temperature through 5000 v; 85° C through 15000 v.

Semi-conducting tape around each conductor prevents excessive voltage stress and ionization between conductor and insulation.

These are features that add up to longer, better, more economical service. Even at peak loading, rugged Roebling Mine Power Feeder Cable gives peak performance!

Pride of workmanship, special design features and finest raw materials make the difference. But don't take our word for it. See for yourself. Let us show you samples and give you recommendations and details as they apply to your application. Write to Electrical Wire, John A. Roebling's Sons Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
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PROX SETS A NEW STANDARD FOR PRODUCTION WITH

THE STURDIEST CUTTER BAR EVER MADE

HEAT-TREATED, HIGHEST GRADE ALLOYS, WELDED FOR GREATER STRENGTH

Prox Cutter Bars are engineered for extra-long service, quick and easy maintenance, added safety. All parts that are subject to wear, are easily and economically replaced for continual, like-new performance. This means less down time, increased savings, higher profits. Prox Cutter Bars are versatile, too, designed to accommodate three cutter heads—roller, semi-circle and semi-circle shoe types. No matter whose mining machinery you're using, there is a Prox Cutter Bar to fit it. Why not check and see?

Made for Prox Tool Steel throwaway bits or conventional ½" x 1". All chain parts made from alloy steels, heat treated for maximum physical performance, all block and connectors drop forged, bushings hardened and ground. Prox chains are made in many thicknesses to fit nearly every type of cutting machine and cutter bar. Get the best—get Prox!

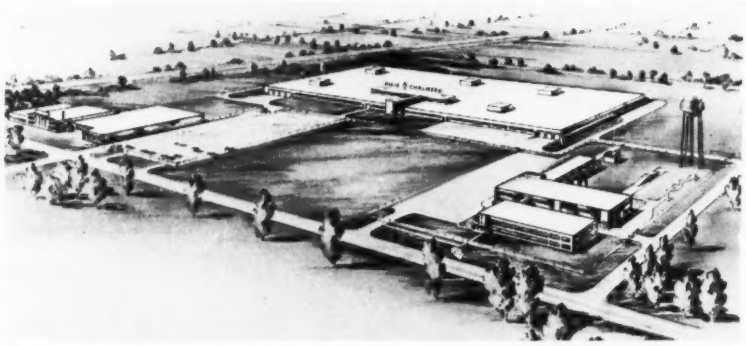
Investigate the complete line of Prox cutting equipment.

PROX

FRANK PROX COMPANY, INC.
TERRE HAUTE, INDIANA

Write for the name of your nearest Prox Sales Representative for complete information.

Among the Manufacturers



MULTI-MILLION dollar engine manufacturing facility is being built by Allis-Chalmers Mfg. Co., at its Harvey, Ill., Works. An engineering and development research laboratory (right) is already in operation and a new building (left), adjacent to Plant No. 2, will provide additional 515,000 sq ft of space.

Steven Bunish has been named manager, portable cable sales, for Anaconda Wire & Cable Co. Since 1953, Mr. Bunish has been a mining-cable engineer for the firm. A graduate of Marion College, in Indiana, Mr. Bunish joined Anaconda in 1942. He has spent much of his time with the firm on research and development of mining and portable cable, and is the author of several technical bulletins on that subject. Mr. Bunish is a member of the American Chemical Society, Illinois Mining Institute and the Open Pit Mining Association.

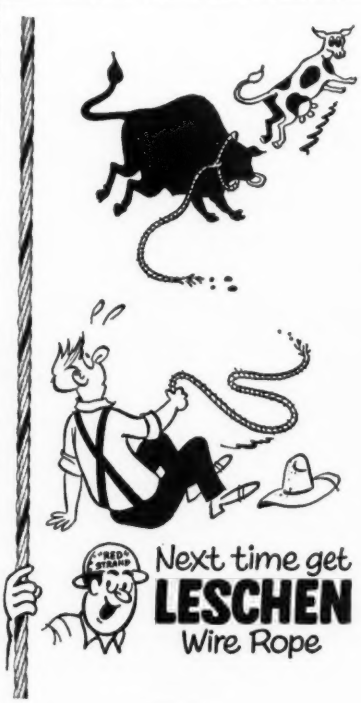
Bunish

Donahue

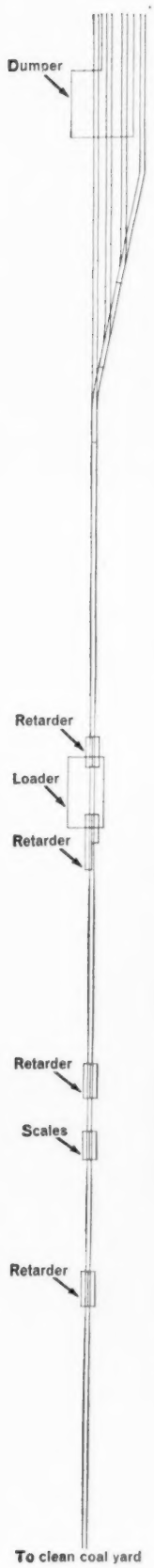
Merry

C. M. Donahue and E. W. Merry, vice presidents, Mine Safety Appliances Co., have been named to new posts in the international and domestic operations of the firm. Mr. Donahue becomes president of the M.S.A. International Div., and continues as vice president of the parent company. He will supervise all international subsidiaries and the Export and Mining Dept. of the parent firm. Mr. Merry is the new executive vice president in charge of domestic operations. Mr. Donahue joined Mine Safety in 1927. He is an engineering graduate of Pennsylvania State University, a past president of the Coal Mining Institute of America and of the Mine Rescue Veterans, Pittsburgh Dist. Mr. Merry received an AB degree in economics from Harvard in 1934 and an MBA from that university in 1936. He joined Mine Safety in 1936 and worked his way up to his most recent position of vice president, Industrial Products Group.

(*Continued on p 182*)



LESCHEN WIRE PORTER ROPE DIVISION
H. K. PORTER COMPANY, INC.



720 tons of coal per hour loaded safely with Union Switch & Signal Car Retarder System

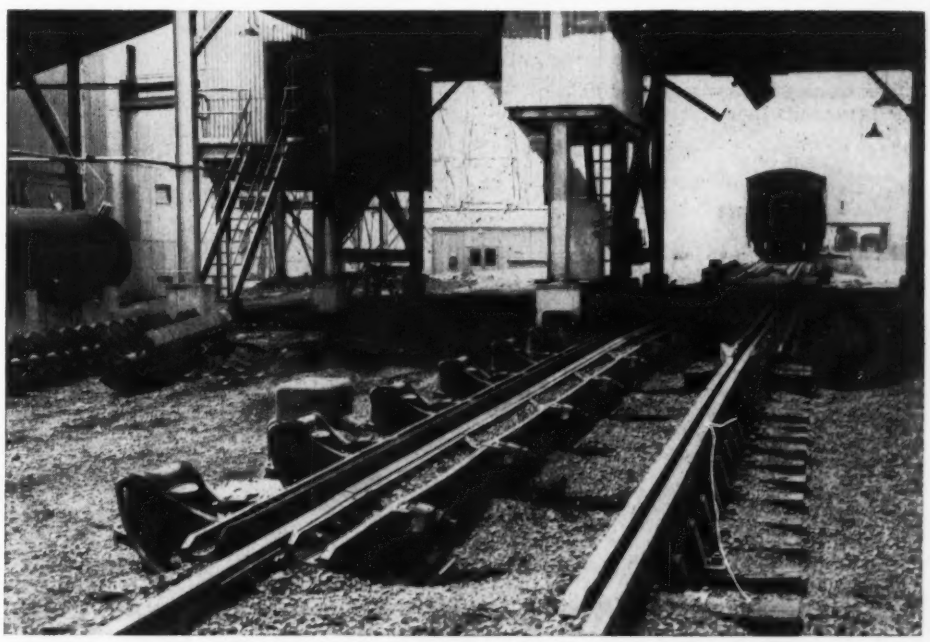
At U. S. Steel's coal cleaning plant, Corbin, Kentucky, a system of four car retarders is used to direct coal cars through loading, weighing and coupling operations. This Union Switch & Signal Car Retarder System places cars with speed and accuracy, eliminates a safety hazard and results in a substantial operating saving.

Empty cars are moved to the loading track where the pushbutton-controlled retarders take over while the cars are loaded. Cars next run by gravity to the retarders at the scale house, are weighed and then run by gravity to a collecting point at another retarder. The entire job is handled quickly and economically by two operators. In three years of operation, the system has been trouble-free and maintenance-free.

Let us help solve your car control problems. We will be happy to discuss with you—without obligation on your part—how a Union Switch & Signal Car Retarder System can speed up operations, promote efficiency, reduce safety hazards. Write today for more complete information.

The first retarder receives and controls empty cars before the loading. Under the loader the cars are slowed down by the second retarder, then move gradually to receive an even load distribution. The third retarder slows the loaded cars for accurate weighing. Just before the coupling, the cars are brought to a complete stop by the fourth retarder.

Empty cars moving to loader are controlled by first retarder, in background. This retarder arrangement provides for availability of 8 empty cars in advance of loading point. As loading progresses, second retarder, in foreground, controls movement of cars being loaded. This system of car handling moves cars with accuracy, assures a full, evenly distributed load.



UNION SWITCH & SIGNAL

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

SWISSVALE, PENNSYLVANIA

NEW YORK ..... PITTSBURGH ..... CHICAGO ..... SAN FRANCISCO

Proving again and again

LOWEST COST PER TON

of materials handled

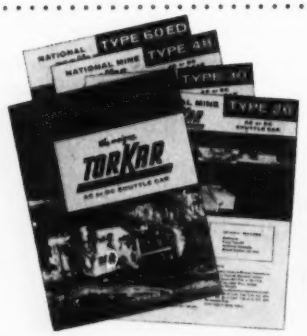
National Mine

TORKARS

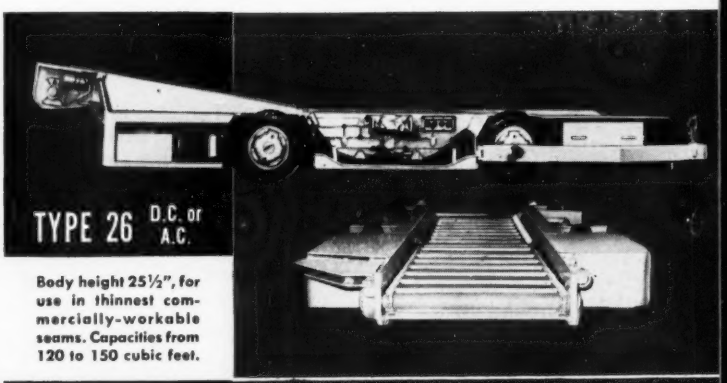
SINGLE PRIME MOVER-TORQUE CONVERTER

Dramatic records for performance and low maintenance are being achieved wherever TorKars are used. TorKars are unique in that they are powered by a single, large capacity motor in place of small multi-motors required on conventional shuttle cars.

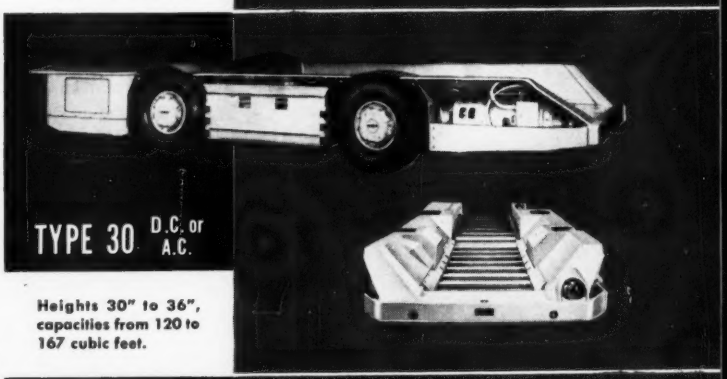
With a torque converter and three-speed forward-and-reverse transmission applying power equally to all four wheels, flexibility of operation is vastly increased, the control system is simplified, service costs are lowered, and high operational standards are maintained.



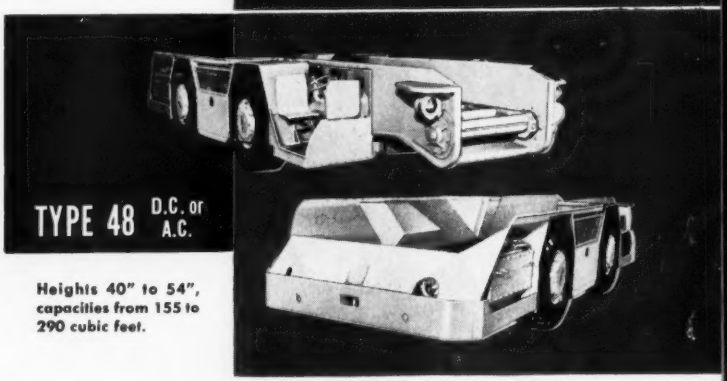
Write *for the informative new TorKar Bulletin and for Specification Sheets on all models.*



Body height 25½", for use in thinnest commercially-workable seams. Capacities from 120 to 150 cubic feet.



Heights 30" to 36", capacities from 120 to 167 cubic feet.



Heights 40" to 54", capacities from 155 to 290 cubic feet.

The trend is to TorK

National Mine Service Company

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to slow down and shift ?

It could well be costing you important time because of slower job cycles. This time is money you'd be saving with TORQMATIC DRIVES in your equipment —and the proof is on TORQMATIC owners' books.

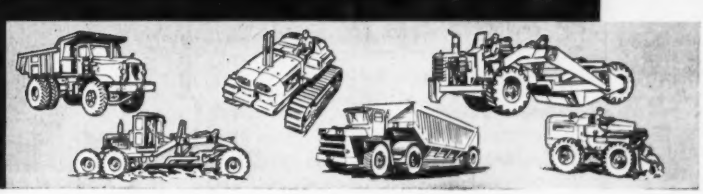
For these owners have their operators quick-shift at *full throttle* – never any power interruption. No more pumping of clutches and timing of shifts. What's more, they don't need a booster tractor to get moving in goo or gob. And these owners free their engines from the shock loads and strains which clash-boxes cause. Ending equipment damage saves them about $1,500 to $2,000 every time they train a rookie driver. Another $800 or more goes into the bank each year because they've wiped out engine-disconnect clutch costs.

The reason? TORQMATIC is controlled by a single, small shift lever. There's no leg-tiring disconnect clutch. TORQMATIC *automatically* adjusts engine power output and speed to load or terrain changes, absorbing harmful and expensive shock loads. It provides a steady, increasing torque to the wheels for a smooth standing start.

The men who are making the extra money—who are underbidding you on your contracts—are probably the men who have switched to TORQMATIC. They *know* they'll more than make up the initial extra cost of TORQMATIC in savings alone. You could, too. So see your equipment dealer or write Allison.

Allison Division of General Motors
Indianapolis 6, Indiana
In Canada: General Motors Diesel Ltd., London, Ontario

Allison TORQMATIC



TORQMATIC® DRIVES

THE MODERN DRIVE FOR MODERN EQUIPMENT

SAVE!

Use it only WHEN and WHERE needed!

(on downgrade loading)

NOLAN

HOLD-A-TRIP

— a sturdy simple holding or braking unit to control trips on down grades

Continuous braking or adjustable by interlocked control with hydraulic or mechanical car feeders

Assures minimum tractive effort or horsepower by automatically adjusting to only required braking effort

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NOLAN SALES AGENTS: [illegible], Jr., 800 Keenan Building, Pittsburgh, Pa.; Huntington Supply & Equipment Co., 423 First Huntington Nat'l Bank Bldg., Huntington, W. Va.; E. C. Horne Machinery Co., 1726 Champa Street, Denver 2, Colorado; Frank C. Mommott, P.O. Box 154, Castle Gate, Utah; J. L. Thomas, 429 South 24th Street, Birmingham 5, Alabama; John North Associates, P.O. Box 105, Harbert, Mich. (Chicago District); Lovitt Safety Limited, Toronto 10, Canada.

THE NOLAN COMPANY

106 Pennsylvania St., Bowerston, Ohio

Manufacturers *(Continued)*

Edward L. Mills has been appointed to succeed David W. Stevens as Link-Belt district manager at Huntington, W. Va. Mr. Stevens has retired after 48 yr with the company. **Earl W. Habberstad** replaces Mr. Mills as district manager at Duluth, Minn. Mr. Mills joined the company in 1948, on graduation as a mechanical engineer from Purdue University. After 6 yr in the Engineering Dept. and 4 yr as district sales engineer at the Pittsburgh Dist. sales office, he was appointed district manager at Duluth in 1958. In Mr. Stevens' lengthy career with the Link-Belt organization, he specialized in coal-tipple engineering, serving as district sales manager at Huntington since 1930. Mr. Habberstad joined the company in 1948 and was transferred to Duluth as sales representative in 1951.

Mills

J. V. S. Norton has been named eastern regional sales manager by Bucyrus-Erie Co. He succeeds F. Leslie Jones who recently retired after 35 yr of service with the company. An engineering graduate of Tufts University, Mr. Norton has been in the mining industry for 34 yr. A Bucyrus employee since 1945, Mr. Norton began his career as general foreman for the Anglo Chilean Consolidated Nitrate Corp. Later United Electric Coal Co., Chicago, Ill., named him as purchasing agent and treasurer. He became manager of the Tennessee Phosphate Div., International Minerals & Chemicals Co., in 1940, later serving as a consultant with the Mining Div. of the War Product Board during World War II.

Norton

Ted Edwards, veteran underground mining man, has been named manager of the Mining Equipment Div., New York Dist., for The Eimco Corp. In his new position he will assist firms engaged in mining both as consultant and sales specialist. He will be responsible for sales of Eimco underground machines such as the 630 loader and dozer, the 635 continuous loader and Model 40, 21 and 12B RockerShovels, in the northeastern area of the country.

Dennis Patrick Shanahan appointed district manager of the Denver office of Harnischfeger Corp., in charge of construction and mining equipment.

William D. Menzie has been named sales manager of the Distributor Products Div., National Mine Service Co. Mr. Menzie, who had been district manager, Whitman Div., in Indiana, Pa., will have headquarters at the firm's executive office in Pittsburgh. A graduate of Pennsylvania State University, he has been with National Mine since 1959. He will be responsible for the sale of all distributor products through the company's eight distributing divisions, including: Wheat electric cap lamps, Scandura belting, Clarkson "Redbird" conveyor chain, Femco communications equipment, Hayden belt-fastening equipment, Riken gas indicators and detectors, Willson safety equipment, Kennametal and Liddicoat bits and a broad range of other mine equipment and supplies.

Menzie

Thomas J. McNeil appointed New York Dist. manager, Eimco Tractor Div., The Eimco Corp.

Herbert L. Martin appointed field representative, central United States, for Arcair Co.

LESCHEN WIRE PORTER ROPE DIVISION

H. K. PORTER COMPANY, INC.

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More than 50 Years' Service to the Coal and Salt Industries
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Contractors
Exploration of Coal Properties. Guarantee satisfactory coal cores. Inside Mine Drilling. Pregrouting. Mine Shafts. Large diameter holes.
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Specialists in exploratory—grout hole and pressure groutings. Rigs located in over 50 strategic areas for prompt service. Free estimates.
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Oliver Building—Mellon Square, Pittsburgh, Penna.

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COMMUNICATION IS OUR BUSINESS

TWS will write, design, and print your Instruction Manuals, Product Bulletins, Training Aids, Industrial Relations Literature, Annual Reports, Company Histories, etc. Save money and time. Let *our* staff be your staff for Technical and Business publications.

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This service is available through ad agencies.

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EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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The advertising rate is $12.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

EMPLOYMENT OPPORTUNITIES—$26.00 per inch subject to agency commission.

INFORMATION:

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

An ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.

UNDISPLAYED RATE

(Not available for Equipment Advertising) $1.50 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See 1 on Box Numbers.)

POSITION WANTED undisplayed rate is one half of above rate, payable in advance.

BOX NUMBERS count one additional line.

Send New ADS or Inquiries to Class Adv. of Coal Age, P. O. Box 12, New York 36, N. Y., For July Issue Closing June 17th

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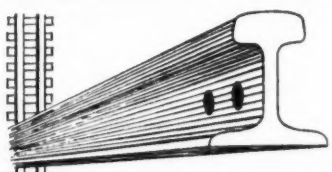

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20—9-J Motors, 4 H.P.
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1—Goodman 665 Loader on Crawlers, latest type 250 V. DC.
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2—Joy 32E15 Shuttle Cars, rebuilt.
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1—Joy T-1 Standard Crawler Truck. 250 DC.
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4—Goodman 312 Cutting Machines, 17″ high.
3—Goodman 412 Cutting Machines, 19″ high.
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6—Goodman 512 Machines with Bugdusters.
6—Goodman 612 Cutting Machines, 250 and 500 volt.
1—Lee Norse low vein Machine Carrier on rubber.
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1—Goodman 2410 Rubber Tired Cutter, Universal head, like new.
3—Joy 11RU Rubber Tired Cutters with bugdusters, Universal heads, dual tires, like new. 250 V. D.C.
2—Joy 10RU Rubber Tired Cutters, Universal head, 220/440 V. A.C. Perfect.
4—Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C.
5—7AU's on track. Universal head.
2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38″ high, on Crawlers, 250 volt D.C.
1—Jeffrey 29LC on Crawlers, rebuilt.

LOCOMOTIVES

1—Goodman 6 ton, 93-A, 27″ high, armor plate frame.
1—Jeffrey 15 ton MH-77 Locomotive, armor plate frame.
3—Jeffrey, 13 ton, type MH-110, 36″, 42″, 44″ ga.
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12—Jeffrey, 6 ton, type MH-88, 42″ 44″ and 48″ ga.
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1—Jeffrey, 6 ton, type 2186, 22″ above rail.
3—Jeffrey, 4 ton, type MH-96, 42″, 44″, 48″ ga.
1—G.E., 4 ton, type 825 Locomotive, 22″ high.
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1—G.E., 8 ton, type 822 Locomotive, 44″ ga.
3—G.E., 10 ton, type 809 Locomotives, 42″, 44″ and 48″ ga.
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3—Westinghouse, type 902, 4 ton, 42″ and 48″ ga.
2—Atlas Battery Locomotives 36″ ga.
1—Atlas Trolley Locomotive, 4 ton, 24″ high.
2—Westinghouse, type 904, 6 ton, 44″ and 48″ ga.
2—Westinghouse, type 906, 44″ and 48″ ga.
2—Westinghouse, type 907, 10 ton, 44″ and 48″ ga.
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6—Shaker Screens.
1—Robins Car Shakeout.
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5—Truck Scales, 25 to 40 ton, late type.
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2—Joy 10RU Rubber Tired Cutters, Universal head 220/440 volt A.C. Perfect.
4—Joy 10RU Rubber Tired Cutters, Universal head. 250 V. D.C.
3—Joy 11RU Rubber Tired Cutters, 250 V. D.C.
1—Goodman 2410 Rubber Tired Cutter, Universal head, new 1956. Excellent.
2—Jeffrey 29UC Universal Machines on Crawlers.
1—Goodman on Crawlers, 31″ overall height.
3—Baby Goodman 212's, rebuilt, 250 V. D.C.
2—Goodman 212 Cutting Machines, 19″ high.
4—Goodman 312 Cutting Machines, 17″ high.
3—Goodman 412 Cutting Machines, 19″ high.
6—Goodman 512's, with Bugdusters, like new.
4—Goodman 512's, rebuilt, or as removed from service.
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1—Joy 7-B Cutting Machine, 250 V. D.C.
4—Joy 11B Cutting Machines, rebuilt, 35 & 50 H.P.
6—7AU's, on track, Universal Head.
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2—Goodman 324 Slabbers.
2—Goodman 724 Slabbers.
2—Goodman 824 Slabbers.
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2—Jeffrey 29L's, on Crawlers, Excellent.
3—Sullivan CE7, 220 V. A.C.

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2—Continental Gin Tandem Belt Drives, 36″.
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2—200KW Westinghouse Rotary Converters, 275 V. D.C. Newly rewound.
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2—Joy 12BU with Piggyback Conveyors.
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1—Goodman 665 Loader, on Crawlers.
2—Goodman 660 Loaders, 440 V. A.C., perfect.
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1—Goodman 460, on track, rebuilt, all hydraulic.
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1—Jeffrey 6′ Aerodyne Fan.
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3—7B Sullivan Cutting Machines, 220/440 Volts A.C.
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2—14 BU-3PE Joy Loading Machines, 250 Volts D.C.
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3—7 BU Joy Loading Machines, 250 Volts D.C.
2—Long 12" Piggyback Conveyors, each 300' long, complete with PT-12 Piggybacks and 12BU Joy Loading Machines.
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1—112 Goodman Cutting Machine, AC.
1—212G-3 Baby Goodman Cutting Machine, AC.
4—14BU-7RBE Joy Loading Machines. 250 Volts DC, equipped with 38-J Head Motors, excellent condition.

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2—6SC-7E Joy Shuttle Cars, Matched Pair.
2—6SC-5E Joy Shuttle Cars, Elevating Discharge, 4-wheel Steering, 250 Volts D.C.
3—42E18 Joy Shuttle Cars, Disc Brakes, Elevating Discharge, Completely Modern, 250 Volts, D.C. 2-Standard, 1-Opposite Standard Drive.
1—42E15A Joy Shuttle Car.
1—32 E-7 Joy Shuttle Car.
2—32E-16 Joy Shuttle Cars

CUTTING MACHINES FOR SALE
1—512 CJ Goodman Cutting Machine, 50 H.P. with bugduster.
1—11RU Joy Cutting Machine, 250 Volts D.C. with 9' Cincinnati Bar, Chain and bugduster.
1—10RU Joy Cutting Machine, 250 Volt D.C. with bugduster.
2—29UC Jeffrey Universal Cutters, Permissible, 250 Volts D.C.
1—512 CCH Goodman Cutting Machine, 250 Volts D.C.
5—35B Jeffrey Cutting Machines, 250 Volts D.C.
6—35BB Jeffrey Cutting Machines, 250 Volts D.C.
1—35 LC Jeffrey Cutting Machine, 35 H.P.
2—29LC Jeffrey Cutting Machines, 250 Volt D.C.
1—512 EJH Goodman Cutting Machine
2—512DA Goodman Cutting Machines, 250 Volts D.C.
2—7AU Sullivan Cutting Machines, 250 Volts D.C.
3—212 AB Goodman Machines.
2—412 AA Goodman Machines.
1—35L Jeffrey Machine 35 H.P.

CONTINUOUS MINERS FOR SALE
3—4JCM Joy Continuous Miners, 440 Volts A.C.
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RECTIFIERS FOR SALE
1—150 KW General Electric Stationary Rectifier, 440 Volts Primary, 275 Volts D.C., Serial No. 6628.
1—400 KW American Selenium Rectifier, 4160 Volts Primary, 275 Volts DC.

ROTARY CONVEYORS FOR SALE
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1—100 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts DC, Pedestal Type.
1—150 KW Westinghouse Rotary Converter, Pedestal Type, 1200 RPM, 2300/4000 Volts Primary, 275 Volts DC.
1—200 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts DC, Pedestal Type.

COAL DRILLS FOR SALE
25—CP-472 Electric Coal Drills, 250 Volts D.C.
5—CP-572 Coal Drills
1—Chicago Pneumatic RBD-30 Roof Drill, Serial No. A858913.
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CRUSHER FOR SALE
1—36" x 36" Double Roll Crusher, complete with 100 H.P. Motor.
1—18" x 30" Double Roll, Double Drive, Scottdale Crusher.
1—Cedar Rapids 20" x 30" Swing Hammer Crusher with 40 H.P., 220/440 Volt AC Motor.
1—Robins 36" x 36" Double Roll Stoker Crusher, specially built with spike teeth equipped with extra set of new segments.
1—Scottdale 20" x 30" Double Roll, Double Drive Crusher.

COMPRESSORS FOR SALE
2—Acme Self-propelled Air Compressors, 83R, Model 168, Capacity 176CFM, with 40 H.P. Reliance Compound Motor. Excellent Condition.
1—Joy WK-85 Air Compressor, Serial No. 53661, rubber mounted, self-propelled, 28½" high, Model 240, maximum pressure 100 lbs.

LOCOMOTIVES FOR SALE
1—MH-150 Jeffrey Locomotive, 42" track gauge, 250 Volt D.C., 26½" high, rebuilt.
1—MH-88 Jeffrey Locomotive, 30" high with CY-21 Reel, 44" track gauge.
1—General Electric 6 Ton Loomotive with Reel, 36" gauge.
1—1030 Goodman Locomotive, 24" high, 44" track gauge.

ROCK DUSTERS FOR SALE
1—MSA Track Mounted Rock Duster, 10 H.P., A.C. or D.C., high pressure, 30" high, any gauge.
2—MSA Bantam Rock Dusters, Rubber Tired, Portable.
2—MSA Bantam Rock Dusters, Skid Mounted.
1—American Mine Door, Wheel mounted bantam type rock duster, 250 Volts D.C., 22" high.

HOISTS FOR SALE
10—#11½ Vulcan-Denver Material Hoists, Complete with 3 H.P. D.C. Compound Wound 1750 RPM General Electric Motor.
1—Brownie Hoist, Model HKM—Good condition.
3—Sullivan Type CHL 5 H.P. Car Spotting Hoists.
2—Brownie Hoists, 5 H.P., A.C.

ELEVATORS FOR SALE
1—PL11-14 Joy Elevator.
2—Joy PL11-16 Elevating Conveyors.

MACHINE TRUCKS FOR SALE
2—T2-5APE Joy Trucks, 250 Volts D.C. Permissible.
1—T2-5APE Joy Machine Trucks, 250 Volt D.C. equipped with hydraulic system for drill.

CHAIN CONVEYORS FOR SALE
5—61AM Jeffrey Chain Conveyors, 10 H.P. 300' long.
3—61HG Jeffrey Chain Conveyors, 5 H.P. 40' long.
700 ft. Goodman 30", 97C Structure complete with drive.
1—Jeffrey 300-ft. 15" Chain Conveyor.
2—Joy 15"—300 ft. Chain Lines.

DIESEL PLANTS FOR SALE
1—60 KW, G.M. Diesel Generator Set, with 60 KW, 250 Volt D.C. Delco Generator.
1—100 KW Waukesha Diesel Generator with 220/440 Volts D.C.
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1—[illegible] Caterpillar Diesel Generator Unit—with Caterpillar engine and 75 KVA G.E. generator self-regulating, 220 Volt A.C.

MOTOR GENERATORS FOR SALE
1—50 KW Westinghouse MG Set, 440 Volt AC, 250 Volt DC.
1—300KW Westinghouse Motor Generator Set, synchronous motor, 433 KW Output. 435 KVA, 2300 Volts, 1200 RPM D.C. generator 300 KW, 275 Volts, 1200 RPM. Compound Wound. Complete with D.C. panel and switch gear.
3—50 KW G.E. and Westinghouse Motor Generator Sets, 2300 Volts A.C., 275 Volts D.C. Complete with switching gear.
1—200 KW Ridgeway Motor Generator Set, Complete with switchgear and 1600 amp. I.T.E. automatic circuit breaker, 2300 A.C., 275 Volts D.C.
1—200 KW General Electrical Diesel Generator Set, direct connected to twin 6-71 GMC Engines complete with switchboard, unit like new.

BELT CONVEYORS FOR SALE
2 only 1200' 26" Belt Conveyors with 30 H.P. 250 Volt D.C. Drives.

THE FOLLOWING OFFERED AS A PACKAGE UNIT ONLY:
1—5CM Joy Continuous Miner, 440 Volts AC.
2—16SC Joy Shuttle Cars, matched pair, 440 Volts AC.

MISCELLANEOUS FOR SALE
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1—PL 11-14 Joy Elevator.
10—Goodman 512 Cutter Bars and Chains.
173—AC&F 42" Gauge, 48" high Drop Bottom Mine Cars, Condition like new.
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2—7½ H.P. Tricycle Type Rubber Tired Mine Tractors, 7½ H.P. 220 Volt Single Phase Motors or 250 Volt D.C. Motors.
3—24 J Motors, 7½ H. P., 250 Volt D.C.
3—75 KVA Transformers, 2300/4000 Wye to 220 Volts.
2—42" Track Gauge Phillips Carriers.
1—Manson Mine Jeeps 40" Track Gauge equipped with 9J Motors.
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1—Compton Model 56 Auger with 300 HP Cummins Diesel Engine Drive, 210 feet, 38" diameter auger (6 sections - 35 feet each); 1—42" cutter head, 70 feet, 48" diameter auger (2 sections—35 feet each); 1—52" cutter head.
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3—75 KVA Undergound Transformers, skid mounted, 40" high.
3—30 KVA Underground Transformers, skid mounted, 40" high.
2—3 H.P. Gear Motors with 15" Head and Tail Assemblies.
2—5 H.P. Gear Motors with 15" Head and Tail Assemblies.
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1,080'—36" Model "C" Joy Belt Conveyor
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1—30" Shop Constructed Belt Conveyor Drive
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1—Lot 9J, 10J, 23J, & 24J Motors

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1—70URB Jeffrey Cutting Machine
5—Long 88 & 88-C Pig Loaders
1—360 Goodman Loader on Rubber
2—Myers Whaley #83 Loaders
1—Lee Norse Jr. Continuous Miner
1—210 cu. ft. Acme Air Compressor
2—125 cu. ft. Acme Air Compressors
7—Manson Jeeps w/9J Motors
1—24BB Clarkson Loader

CUTTING MACHINES

1—70-URB Jeffrey Cutting Machine, 250 V.DC
4—11RU Joy Cutting Machines w/Bugdusters
3—29B Jeffrey Cutting Machines
1—29C Jeffrey Cutting Machine
1—824 Goodman Slabber
6—7AU Sullivans
5—7B Sullivans
16—11B Sullivans, 35 & 50 h.p., 250 V.
19—12AB, 12AA & 112AA Goodmans, 250 V.
9—212AA Baby Goodmans, 250 V.
16—512 Goodman Cutting Machines, w/Bugdusters, hydraulic
2—512 Goodman Cutting Machines, 220 V.AC
1—712CJ Goodman Cutting Machine, 250 V.DC
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16—6 Ton MH88 Jeffrey Locomotives
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10,945'—#2 Solid Copper Highline Wire
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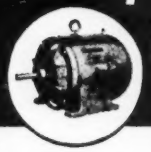

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—ADVERTISERS IN THIS ISSUE—

***Indicates more product information may be found in company advertising appearing in COAL AGE 1959 July Mining Guidebook and Buying Directory Issue. Check your Guidebook index.**

*Allegheny Ludlum Steel Corp. 39
Allied Chemical Corp. Solvay Process Div. ... 50
Allison Div. General Motors 181
*Alloy Rods Co. 93
*Aluminum Co. of America 149
*ACF Industries Inc. American Car & Foundry Div. 42
*American Manganese Steel Div. American Brake Shoe Co. 169
*American Oil Co. 49
*American Pulverizer Co. 168
*American Steel & Wire Div. United States Steel Corp. 86–87
Ashland Oil Co. 41

*Barber-Greene Co. 162–163
*Bethlehem Steel Co. 12, 101, 161
*Bird Machine Co. 4

*Carrier Conveyor Div. Chain Belt Co. 112
*Caterpillar Tractor Co. 62–63, 190
*Chicago Pneumatic Tool Co. 155
*Cincinnati Mine Machinery Co. 129
*Cross Perforated Metal Plant, National Standard Co. 145

Detroit Diesel Engine Div. General Motors .. 53
*Dorr-Oliver Inc. 56–57
Dowty Mining Ltd. 20–21
*Dravo Corp. 32
*du Pont de Nemours & Co. E. I. Elastomers Div. 153
Durakool Inc. 43

Eaton Manufacturing Co. 8
Ensign-Bickford Co. 70
*Ensign Electric & Manufacturing Co. 102
Euclid Div. General Motors 14
*Exide Industrial Div. Electric Storage Battery Co. 170

*Fairmont Machinery Co. ..... Second Cover
*Federal Mogul Service Div. Federal-Mogul-Bower Bearings Inc. 65
*Fenco Inc. 51
Firestone Tire & Rubber Co. 125
Flexible Steel Lacing Co. 92
Foote Mineral Co. 60

Gates Rubber Co. 47
General Tire & Rubber Co. 166
*Goodman Manufacturing Co. 29
Goodrich Aviation Products B. F. 107
*Goodrich Industrial Products Co. B. F. 1
*Goodrich Tire Co., Div. B. F. Goodrich Co. . 157
Goodyear Tire & Rubber Co. 13

*Harnischfeger Corp. 44–45
*Hendrick Manufacturing Co. 127
Hendrix Manufacturing Co. 36
*Heyl & Patterson Inc. 128

Illinois Gear & Machine Co. 165
*International Harvester Co. 66–67
*International Harvester Co. (Payscrapers) .. 68–69
*Jeffrey Manufacturing Co. 120–121
*Joy Manufacturing Co. 2–3, 124

Kaiser Aluminum & Chemical Corp. 33, 34–35
*Kennametal Inc. 37
Koehring Co. 22–23

*Lee-Norse Co. 16–17
*LeRoi Div. Westinghouse Air Brake Co. 91
*Link-Belt Co. ..... Fourth Cover
Long-Airdox Co. Div. of Marmon-Herrington Co. ..... Third Cover
*Ludlow-Saylor Wire Cloth Co. 174

*Marietta Concrete Div. American Marietta Co. 40
Marlin-Rockwell Corp. 173
*McNally Pittsburgh Manufacturing Co. 103, 104–105, 106, 160
Metallurgical Products Div. General Electric Co. 54, 55
*Mine Safety Appliances Co. 31

*National Mine Service Co. 180
Nolan Co. 182

*Ohio Brass Co. 6, 27
*Okonite Co. 61

Pattin Manufacturing Co. 60
*Porter Co. Inc. H. K. Leschen Wire Rope Div. 40, 164, 178, 182
National Electric Div. 171
Thermoid Div. 172
*Post-Glover Electric Co. 176
Prox Co. Inc. Frank 178

*Republic Steel Corp. 58–59
*Roberts & Schaefer Co. 159
*John A. Roebling's Sons Div. The Colorado Fuel & Iron Corp. 113, 177

Searchlight Section 183–188
*Simplex Wire & Cable Co. 19
*Spencer Chemical Co. 85
*Stamler Corp. W. R. 46
*Standard Oil Co. of Indiana 24–25
Stephens-Adamson Manufacturing Co. Standard Products Div. 48
Sun Oil Co. 52

*Templeton, Kenly & Co. 84
*Texaco Inc. 175
Timken Roller Bearing Co. 15
Torrington Co. 18

*Union Switch & Signal Div. Westinghouse Air Brake Co. 159
*United States Rubber Co. (Mechanical Goods Div.) 1
*United States Steel Corp. 151

Wedge-Wire Corp. 167
*Westinghouse Electric Corp. 118–119
Whitmore Manufacturing Co. 64
*Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp. 147

•

PROFESSIONAL SERVICES 183

•

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.
PROFESSIONAL SERVICES 183
EMPLOYMENT OPPORTUNITIES 184
EQUIPMENT (Used or Surplus New) For Sale 184-188
WANTED Equipment 184

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This No. 12 Motor Grader smooths the way for mine output of 3,000 tons per day

Proper haul road maintenance is a basic requirement. If equipment can't get in and out easily and quickly a mine can't operate at maximum efficiency. Logical solution . . . a motor grader that does the job correctly with minimum operating cost. For example, the Cat No. 12 Motor Grader shown above is working at Island Creek Coal Company's mine at Coal Mountain, West Virginia. In an eight-hour day it covers five miles of road. In addition, this No. 12 maintains roads for two other mines in the area . . . occasionally dresses a company airport runway.

Says Maintenance Superintendent Ernest Carey, "The conditions under which the No. 12 works are rugged. A piece of equipment has to be tough to take it, and this machine fills the bill."

Now the No. 12E is even hardier than ever. The most notable improvement is the new compact engine which provides greater lugging ability in tough going, longer life and easier servicing. Horsepower remains the same . . . 115 . . . but this new engine now develops higher torque and gives the No. 12 greater load-handling capacity. Besides a new compact engine, the No. 12 Motor Grader now has the dry-type air cleaner as standard. Removing 99.8% of all dirt from intake air, this air cleaner can be serviced in five minutes . . . cuts maintenance time by as much as 70%, and substantially reduces costs, extends engine life.

Still retained are the many important features that have made the No. 12 the leader in its class. There's the oil clutch, providing up to 2,000 hours without adjustment . . . the equivalent of 12 months of operation. Ample clearance between the top edge of the blade and bottom edge of the circle provides greater rolling action . . . allows more material to move across the blade. Improved mechanical controls reduce kickback . . . make engagement easier. Blade controls have a mechanical lock. When control is in neutral, the power shaft is locked by a set of gear teeth to prevent creeping.

These are just a few of the reasons why the NEW Cat No. 12E Motor Grader is out front. For the complete picture, see your Caterpillar Dealer. Ask him to demonstrate on your job.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U. S. A.

CATERPILLAR

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THE NO. 12— IMPROVED FOR EVEN HIGHER PRODUCTION

THE LONG COMPANY
and
AIRDOX CO.

UNITE TO BETTER SERVE THE COAL INDUSTRY

There's a new force in the coal mining equipment industry. The Long Company and the Airdox Company (formerly Cardox Corporation), both long experienced in filling the ever-changing needs of the coal industry, are pooling their technical and marketing facilities. The result will be better service, even better products and lower costs for customers.

Long-Airdox will operate as the mining equipment division of Marmon-Herrington Company, Inc. of Indianapolis, Indiana. Marmon-Herrington has based a considerable portion of its growth and expansion on the firm conviction that the nation's need for coal and coal chemicals will become even more insatiable.

Long-Airdox is a new name. But its people are known, experienced and *knowledgeable* in the coal industry. And, it is an organization that will grow not just to become bigger, but more importantly, to grow better through helping you solve your mining problems more practically and more economically.

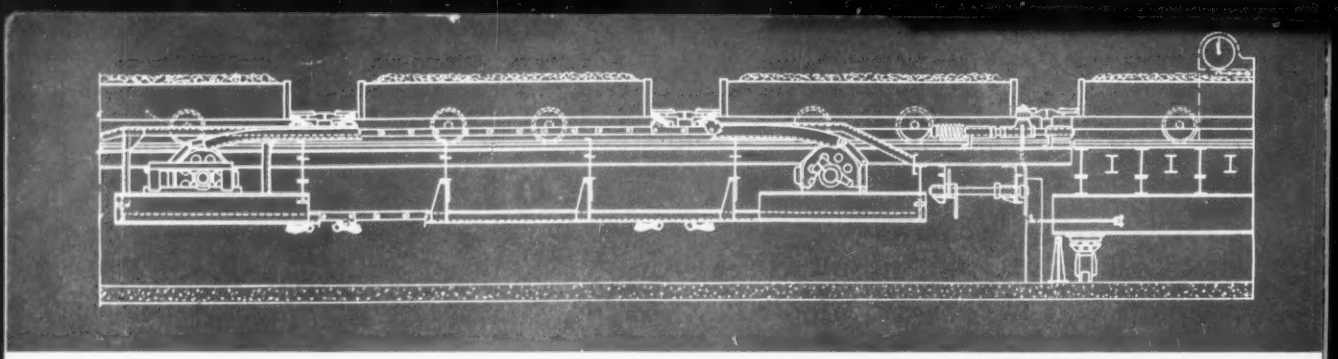
LONG-AIRDOX PRODUCTS *for mining and conveying:* "Full Dimension" Systems • Continuous Mining Equipment • Mobile Loading Machines • "Piggyback" Conveyors • Belt and Chain Conveyors • Extensible Conveyors • Mobile Coal Drilling Machines • Roof Bolting Machines • Battery Tractors and Trailers • Airdox and Cardox Non-Explosive Mining Methods • Auger Miners • Horizontal and Vertical Surface Drilling Machines • Augers of all types • Carbide Mining Tools

LONG-AIRDOX CO.

Oak Hill, W. Va. and Chicago, Ill.

Division of Marmon-Herrington Company of Indianapolis, Indiana

FIELD OFFICES: Pikeville, Ky. · Ottumwa, Iowa · Harper, W. Va. · St. Clairsville, Ohio · Benton, Illinois
Louisville, Colorado · Finleyville, Pa. · Camden-on-Gauley, W. Va. · Evansville, Ind. · Morgantown, W. Va.



Elevation of typical mine car haul installation. Design includes rugged chain, pushers, and guiding members.

LINK-BELT mine car hauls and dumpers

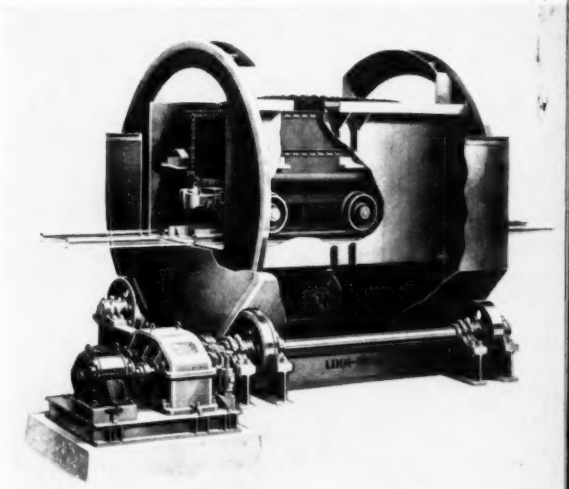
speed raw coal handling . . . safely

Fast and powerful, yet smooth and gentle—Link-Belt's rugged car hauls ride out the shocks of frequent start-stop operation; rotary dumpers automatically spot one or a train of cars, rotate 360° for thorough unloading and realign accurately in their original position.

Mine cars of all types and sizes are handled easily without damage. Dumpers are capable of unloading cars at a fast rate without uncoupling. Both friction and chain driven types accommodate either 4- or 8-wheel cars.

Modern mining operations include Link-Belt car hauls and dumpers in complete unloading systems or as individual components to increase output. Contact your nearby Link-Belt office. Ask for a copy of Book 2655 describing a complete line of coal handling and preparation equipment.

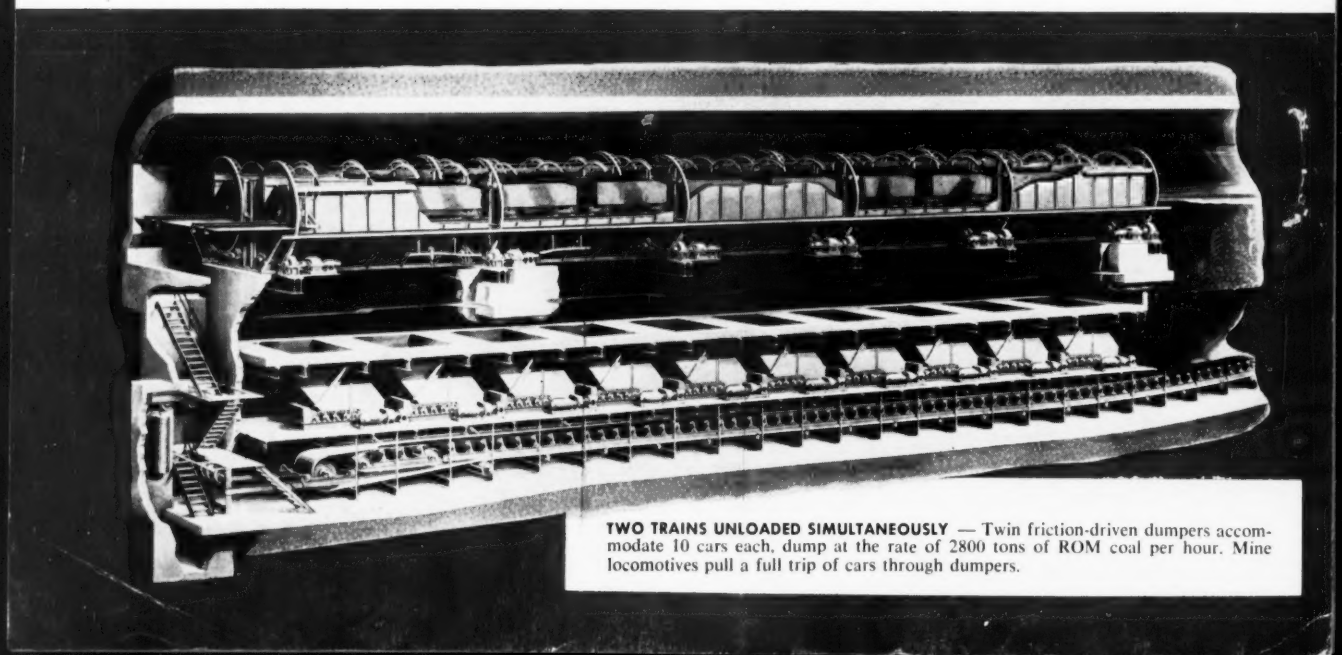
POSITIVE-DRIVE DUMPER — Roller chain drive provides maximum control of dumping operation. Revolves 360°, handling all types of cars fast, automatically — without shock.



LINK-BELT

COAL PREPARATION AND HANDLING EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Birmingham 9, Cleveland 20, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 8, Pittsburgh 13, Seattle 4, St. Louis 1. To Serve Industry There are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.



TWO TRAINS UNLOADED SIMULTANEOUSLY — Twin friction-driven dumpers accommodate 10 cars each, dump at the rate of 2800 tons of ROM coal per hour. Mine locomotives pull a full trip of cars through dumpers.